

OPERATION AND MAINTENANCE



SWAN MODEL 500-CX

 **SWAN**
ELECTRONICS
OCEANSIDE, CALIFORNIA
A subsidiary of Cubic Corporation

OPERATION AND MAINTENANCE

SWAN MODEL 500-CX

Transceiver



INTRODUCTION

The Swan Model 500CX Transceiver together with its accessories and optional equipment, is designed to be used in either CW, AM or SSB modes on all portions of the 80-, 40-, 20-, 15-, and 10 meter amateur radio bands. Many of the MARS frequencies may also be covered by using the Model 510X oscillator accessory.

The Model 500CX generates a single sideband signal by means of crystal lattice filter, and the transceive operation automatically tunes the transmitter to the received frequency. Provisions are included in the transceiver for operation on either upper or lower sideband.

Basic circuitry of the single conversion design has been proven in several thousand of the popular Swan transceivers. Mechanical, electrical, and thermal stability is exceptionally high. All oscillators are temperature com-

pensated and voltage regulated. Push-to-talk operation is standard, with provision for plugging in the Model VX-2 accessory Vox unit for automatic voice control and CW break-in.

Operation may be fixed, station, portable, or mobile. Power input on all bands exceeds 550 watts, PEP, on single sideband, 360 watts on CW, and 125 watts on AM. The Model 500CX includes automatic gain control (AGC), automatic level control (ALC), automatic noise limiter (ANL), grid block keying, CW sidetone monitor, and provisions for break-in CW.

Recommended power supplies are the Model 117-XC for 117 volts AC operation, the Model 230-XC for 230 volts AC, and the 14-117 for 12-14 volts D.C. These power supplies, as well as other accessories, are described in later sections of this manual.

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SPECIFICATIONS

FREQUENCY RANGES

80 Meters	3.5 to 4 mc.
40 Meters	7.0 to 7.450 mc.
20 Meters	14.0 to 14.450 mc.
15 Meters	21.0 to 21.450 mc.
10 Meters	28.0 to 29.7 mc.

POWER INPUT

Single Sideband, Suppressed Carrier:
550 watts, PEP, minimum on all bands.
CW: 360 watts, dc input on all bands.
AM (Single Sideband with Carrier):
125 watts dc input on all bands.

DISTORTION

Distortion products down approx. 30 db.

UNWANTED SIDEBAND SUPPRESSION

Unwanted sideband down more than 50 db.

CARRIER SUPPRESSION

Carrier suppression greater than 60 db.

RECEIVER SENSITIVITY

Less than 0.5 microvolt at 50 ohms impedance for
signal-plus-noise to noise ratio of 10 db.

AUDIO OUTPUT AND RESPONSE

Audio output, 4 watts to 3.2 ohm load. Response
essentially flat from 300 to 3000 cps in both receive
and transmit.

TRANSMITTER OUTPUT

Wide-range Pi-network output matches antennas es-
sentially resistive from 15 to 500 ohms impedance,
with coarse and fine load adjustment.

AMPLIFIED ALC

Limits modulation level.

AUDIO SIDETONE

For CW Monitoring

PLUG IN VOX

Optional accessory. Also provides bk-in CW.

FRONT PANEL CONTROLS

AF-RF Gain, Sideband Selector CAL-REC-
TRANS-CW-TUNE, Mic. Gain, Bandswitch, Car-
rier Balance, PA Plate Tune, PA Grid Tune, PA Load
Course, PA Load Fine, VOX-PTT Switch, ANL
Switch, Dial set, Output Level, 25-100 kc calib.
switch.

REAR PANEL CONTROLS AND CONNECTIONS

Bias potentiometer, CW key jack, Jones plug power

connector, Vox connector, Antenna jack, S-Meter
zero, Auxiliary relay switching, Outboard VFO con-
nector.

VACUUM TUBE COMPLEMENT

V1	6EW6 VFO Amplifier
V2	12BE6 Transmitter Mixer
V3	6GK6 Driver
V4	6LQ6 Power Amplifier
V5	6LQ6 Power Amplifier
V6	12BZ6 Receiver RF Amplifier
V7	12BE6 Receiver Mixer
V8	12BA6 First IF Amplifier
V9	12BA6 Second IF Amplifier
V10	12AX7 Product Detector/Receive Audio
V11	6BN8 AGC/ALC Amplifier
V12	6GK6 Audio Amplifier
V13	6JH8 Balanced Modulator
V14	12AX7 Mic. Amplifier/Transmit Audio

DIODE AND TRANSISTOR COMPLEMENT

Q1	VFO
Q2	Emitter Follower
Q3	Carrier Oscillator
Q4	Crystal Calibrator
Q5	Crystal Calibrator
Q6	Crystal Calibrator
Q7	Crystal Calibrator
D401	Relative Output Diode
D701	Overload Diode
D1101	ANL Diode
D1102	ANL Diode
D1201	CW Switching Diode
D1202	CW Switching Diode
D1801	Zener
D1802	Relay Silencing Diode
D1803	AGC Diode
D1804	AGC Diode
D1805	AGC Diode

POWER REQUIREMENTS

Filaments 12.6 volts, 5.5 amps, ac or dc
Relay 12 volts dc, 250 ma.
Bias - 110 volts dc, 100 ma.
Med. voltage
275 volts dc, 150 ma.
High voltage
800 volts dc, 550 ma. Peak Trans.

DIMENSIONS AND WEIGHT

Height	5 1/2 in.	Depth	11 in.
Width	13 in.	Weight	17 1/4 lb.

A. CIRCUIT THEORY

GENERAL DISCUSSION

The Swan 500CX transceiver provides single sideband, suppressed carrier transceive operation, and generates the single sideband signal by means of a crystal lattice filter. To permit a logical discussion of this mode of operation, certain definitions are necessary. In a normal AM signal, (double sideband with carrier), a radio frequency signal is modulated with an audio frequency signal. This is considered by many to be merely a case of varying the amplitude of the carrier at an audio rate. In fact, however, there are actually sideband frequencies generated, which are the results of mixing the RF and the AF signals. These sidebands are the sum of, and the difference between the two heterodyned signals. In the detection of this conventional AM signal, the two sidebands are mixed with the carrier to recover and reproduce the audio intelligence. This is an inefficient means of transmission, because only 25 percent of the transmitted power is used to transmit intelligence. There are other attendant drawbacks, also. The bandwidth of AM voice transmission is approximately 6 kc, while the actual demodulated audio is only approximately 3 kc. The result is inefficient use of the frequency band, and over half of the allotted band is unusable due to heterodynes, interference, and congestion.

In the single sideband, suppressed carrier mode of transmission, only one of the sideband signals is transmitted. The other sideband and the carrier are suppressed to negligible level. In addition to increasing the transmission efficiency by a factor of four, single sideband effectively doubles the number of stations or channels which can be used in a given band of frequencies.

It should be remembered that in the single sideband, suppressed carrier mode of transmitting, the unwanted sideband and carrier are only suppressed, not entirely eliminated. Thus, with a transmitted signal from a transmitter with 50 db sideband suppression, the other or unwanted sideband will be present, and will be transmitted, but its level will be 50 db below the wanted sideband. When this signal is received at a level of 20 db over S9, the unwanted sideband will be present at a level of approximately S5. The same is true of carrier suppression. With carrier suppression of 60 db, and a signal level of 20 db over S9, carrier will be present at a level of approximately S3 to S4.

In the Model 500CX transceiver, the single sideband suppressed carrier signal is generated by the crystal lattice filter method. For details, refer to the schematic diagram, and to Figures 1, 2, and 3.

SIGNAL GENERATION

When the push-to-talk switch on the microphone is pressed, the transmitter portion of the transceiver is activated, and it generates a single sideband, suppressed

carrier signal in the following manner. Carrier is generated by a crystal oscillator using transistor, Q3. This stage operates in both the transmit and receive modes. When transmitting, the RF output of the oscillator is injected into the control grid of the Balanced Modulator, V13. This balanced modulator is a beam deflection tube, and operates similar to a cathode ray tube in that the electron beam from the cathode is deflected to one output plate or the other by the charge appearing on the deflection plate. The carrier signal fed to the control grid of the balanced modulator appears on both plates of the output. The two plates are connected to Transformer T1301 in push-pull, so the carrier signal cancels itself out in T1301. The deflection plate DC voltages are adjusted by means of the carrier balance control so that the RF being fed to the output plates will cancel out, and the output from T1301 will be zero. Audio signals from the Microphone Amplifier, V15, are applied as a modulating voltage to one deflection plate, and the two sidebands resulting from the sum and difference frequencies of the audio and carrier signals appear in the output of transformer T1301. Carrier suppression is approximately 60 db.

The double sideband, suppressed carrier signal is then coupled from the secondary winding of T1301 to the crystal filter, which suppresses the lower sideband, and permits only the upper sideband to be fed to the First IF Amplifier, V8. The carrier frequency is generated at approximately 5500.0 kc, normal sideband. With the opposite sideband crystal, the carrier crystal frequency will be 5503.3 kc, and this positions the double sideband signal on the other side of the filter response curve, attenuating the upper sideband by at least 50 db. In the single conversion mixing process, these sidebands become inverted on 80 and 40 meters. Thus the Swan-500CX normally operates on lower sideband on 80 and 40, while on 20, 15, and 10 meters normal operation is on upper sideband.

Q1, the VFO 2N706 Oscillator, operates in the common base configuration as a colpitts oscillator. Q2, The Emitter Follower is used for isolation. The extremely good regulation achieved through using the Zener diode regulator D1801 across the bias supply voltage, also contributes to the stability. Bandswitching is accomplished by changing the tank circuit coil. The VFO in the Model 500CX exhibits extremely good stability after the initial warm-up period. Drift from a cold start will be less than 1 kc for the first hour on 80, 40, and 20-meter bands, and less than 20 kc on 10 and 15 meters. After the initial warm-up period, drift will be negligible.

The single sideband, suppressed carrier signal from the first IF Amplifier is fed to the Transmitter.

A. CIRCUIT THEORY (Cont.)

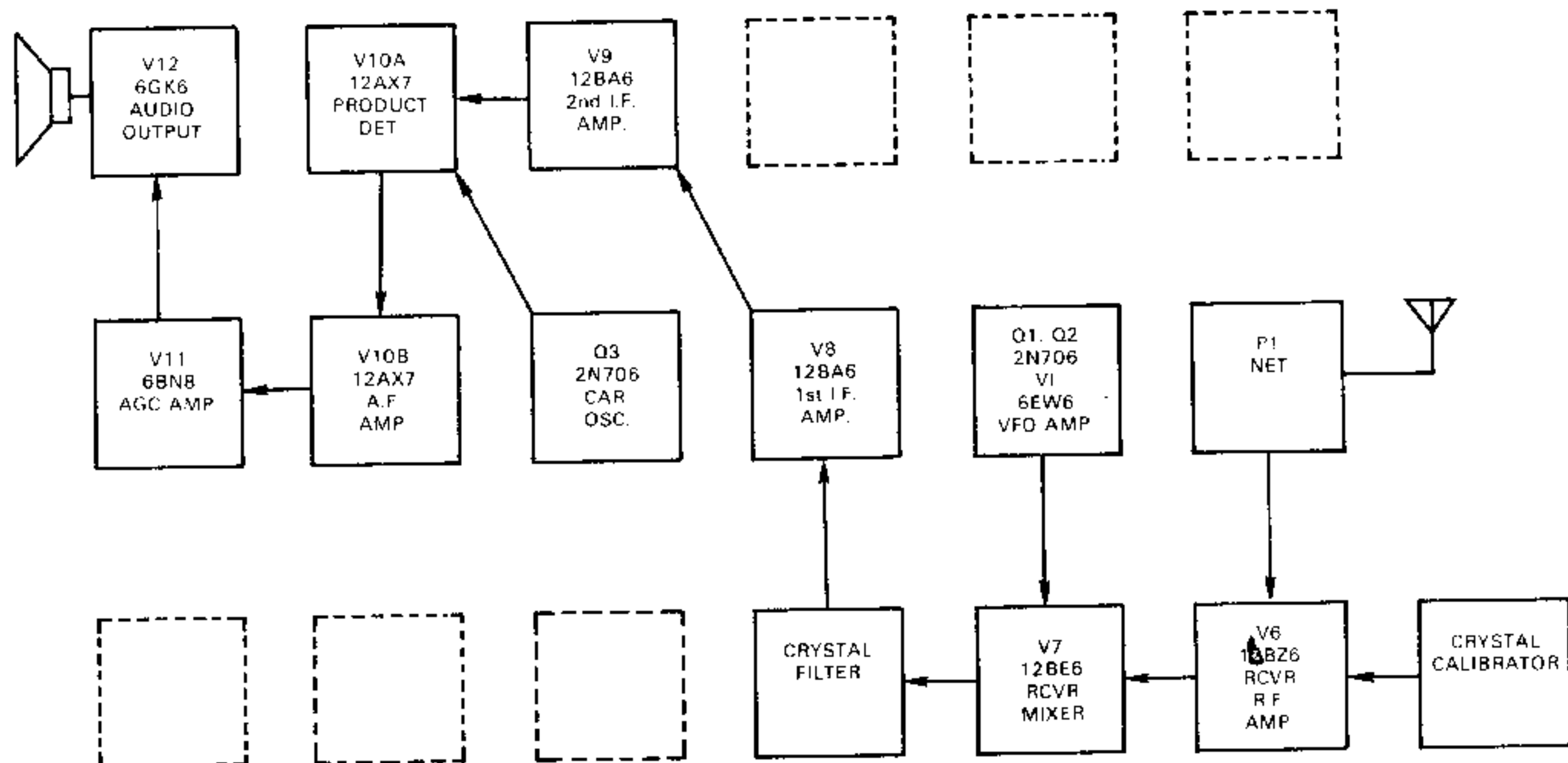


FIGURE 1. BLOCK DIAGRAM, RECEIVE MODE

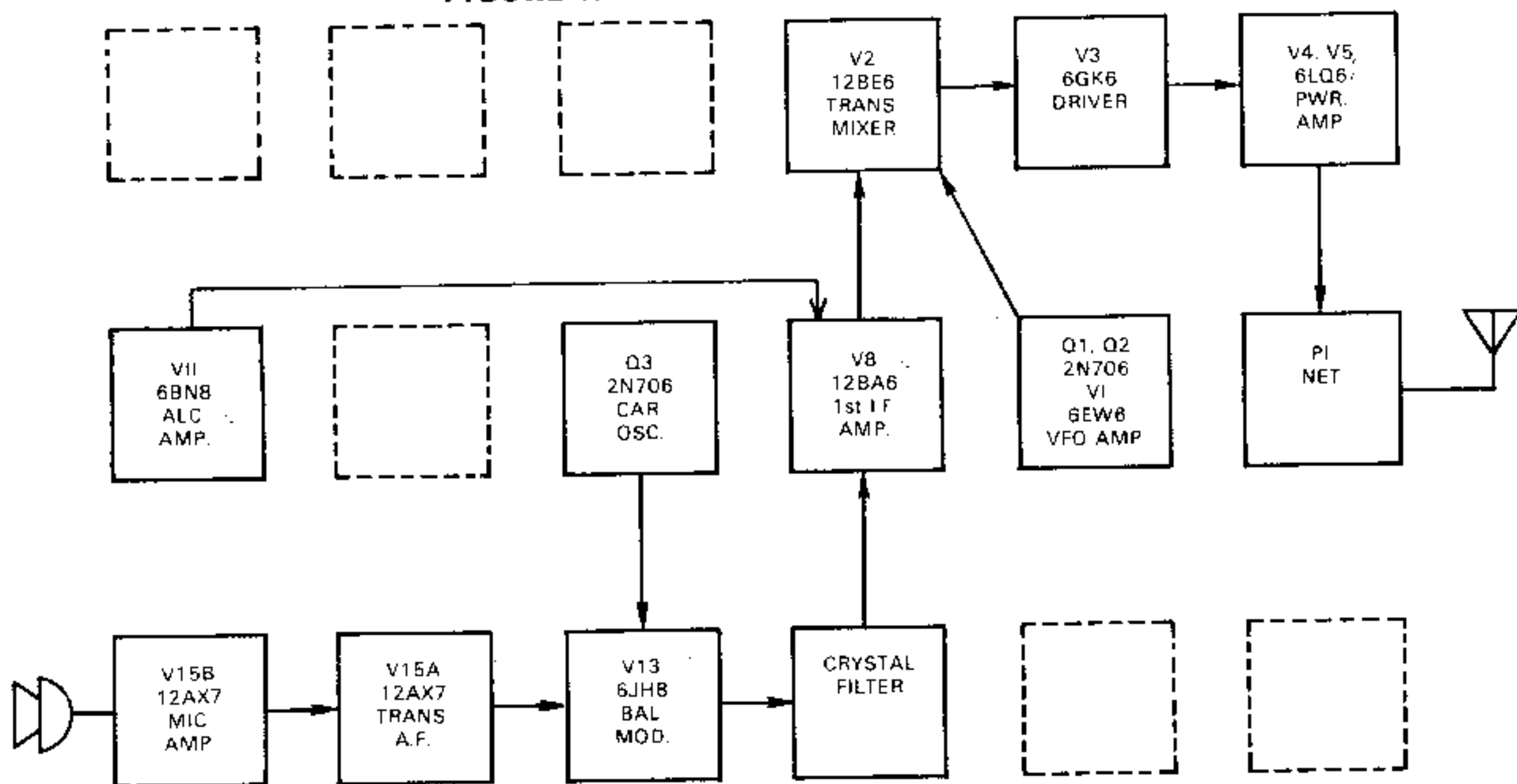


FIGURE 2. BLOCK DIAGRAM, TRANSMIT MODE

SIGNAL GENERATION (Cont.)

Mixer, V2, where it is heterodyned with the VFO signal. The resultant signal at the desired transmit frequency is amplified by the Driver, V3, and the Power Amplifiers, V4 and V5. The signal from the VFO Amplifier is initiated in the transistorized VFO-Emitter Follower circuit Q1 and Q2. The signal from the VFO is routed to the VFO Amplifier, and on 40 and 80 meters, is subtractively mixed with the single sideband signal from the IF Amplifier, and result in LSB operation. On 20, 15, and 10 meters, the frequencies are additively mixed, resulting in output on the upper sideband.

When in TRANSMIT, the gain of the First IF Amplifier, is controlled by an amplified ALC circuit, V11, in response to the average input power to the Power Amplifiers. This ALC system will compensate for extremely strong input signals, but does not completely eliminate the necessity of proper adjustment of the Mic. Gain Control. This feature will help prevent the transmitter from flat topping and spurious emissions, but considerable distortion may occur if the Mic. Gain Control is not properly adjusted. Refer to Operating Instructions.

B. INSTALLATION

POWER SUPPLY

1. **AC Operation.** The Swan Models 117-XC or 230-XC Power Supplies provide all necessary voltages required by the transceiver for AC operation. The supplies come equipped with a pre-wired plug and cable, all ready for plugging into the transceiver.

2. **DC Operation.** The Model 14-117 supply for mobile operation includes all necessary cables, connector plug, fuses, and installation hardware. The Jones plug for connection to the transceiver is furnished with the unit.

Power requirements for the Swan 500-CX are listed in the following table. Pin connections to the Jones type power connector are listed as an aid in connecting other brands or home-brew supplies.

JONES PLUG CONNECTIONS

	Pin	Nominal	Minimum	Maximum
High Voltage	8	800 VDC 550 MA	600 VDC Low Pwr.	1200 VDC Hi. Power
Medium Voltage	10	275 VDC 150 MA	225 VDC	325 VDC
Bias Voltage	3	-110 VDC 100 MA	-100 VDC	-130 VDC
Filament Voltage	4	12.6 V* 5.5 Amp	11.5 V	14.5 V
Relay Voltage	5	12 VDC 250 MA	10 VDC	14.5 VDC
* AC or DC				

ANTENNA

1. **Fixed station.** Any of the common antenna systems designed for use on the high frequency amateur bands may be used with the Swan transceiver, provided the input impedance of the transmission line is not outside the capability of the pi-output matching network. The transmission line should be of the coaxial cable type. An antenna system which shows a standing wave ratio of less than 4:1 when using 50 or 75 ohm coaxial transmission line, or a system that results in a transmission line input impedance that is essentially resistive, and between 15 and 500 ohms will take power from the transceiver with little difficulty. If open-wire or balanced type transmission line is used with the antenna, a suitable antenna tuner is recommended between the transceiver and the feed line. Methods of construction and operating such tuners are described in detail in the ARRL Antenna Handbook, and similar publications. For operation on the 75 and 40 meter bands, a simple dipole antenna, cut to resonance in the most used portion of the band, will perform satisfactorily. For operation on the 10, 15,

and 20 meter bands, the efficiency of the station will be greatly increased if a good directional rotary antenna is used. Remember that even the most powerful transmitter is useless without a proper and efficient antenna system.

2. **Mobile Station.** Mobile antenna installations are critical, since any mobile antenna for use on the high frequency bands represents a number of compromises. Many amateurs lose the efficiency of their antenna through improper tuning. Points to remember about the mobile antenna used with the Swan 500-CX are:

a. The "Q" of the antenna loading coil should be as high as possible. There are several commercial models available which use high "Q" coils, including the Swan Model 45 and Model 55 five band "Swantennas."

b. The loading coil must be capable of handling the power of the Model 500-CX without overheating. In TUNE position, the power output of the transceiver may exceed 250 watts. Wide spaced, heavy wire loading coils are essential.

c. The SWR bridge is a useful instrument, but unfortunately it is quite often misunderstood, and overrated in importance. Basically, the SWR bridge will indicate how closely the antenna load impedance matches the transmission line. With long transmission lines, such as will be used in many fixed station installations, it is desirable to keep the impedance match fairly close in order to limit power loss. This is particularly true at the higher frequencies. The longer the line, and the higher the frequency, the more important SWR becomes. However, in mobile installations the transmission line seldom exceeds 20 feet in length, and an SWR of even 4 to 1 adds very little to power loss. The only time SWR will indicate a low figure is when the antenna presents a load close to 50 ohms, but many mobile antennas will have a base impedance as low as 15 or 20 ohms at their resonant frequency. In such a case, SWR will indicate 3 or 4 to 1, and yet the system will be radiating efficiently.

d. The really important factor in your mobile antenna is that it should be carefully tuned to resonance at the desired frequency. The fallacy in using an SWR bridge lies in the fact that it is sometimes possible to reduce the SWR reading by detuning the antenna. Field strength may actually be reduced in an effort to bring SWR down. Since field strength is the primary goal, we recommend a Field Strength Meter for antenna tuning.

e. For antenna adjustments, the Swan-500-CX may be loaded lightly to about 100 ma. cathode current instead of the usual 500 ma. This will limit tube dissipation during adjustments, and will also help reduce interference on the frequency. In any case, do not leave the transmitter on for very long at one time. Turn it on just long enough to tune and load, and get a field strength reading.

ANTENNA (cont.)

Start out with the antenna whip at about the center of its adjustment range. Set the VFO to the desired operating frequency and then adjust P. A. TUNE for dip, and P. A. LOAD for 100 ma. Then observe the field strength reading. The Field Strength Meter may be set on top of the dash, on the hood, or at an elevated location some distance from the car.

Change the whip length a half inch, or so, at a time, retune the P. A. for 100 ma. loading each time, and check field strength. Continue this procedure until the point of maximum field strength is found. This adjustment will be most critical on 75 meters, somewhat less critical on 40, etc., until on 10 meters the adjustment will be quite broad. After tuning the antenna to resonance, load the P. A. to full power.

MICROPHONE

The microphone input is designed for high impedance microphones only. The choice of microphone is important for good speech quality, and should be given serious consideration. The crystal lattice filter in the transceiver provides all the restriction necessary on audio response, and further restriction in the microphone is not required. It is more important to have a microphone with a smooth, flat response throughout the speech range. The microphone plug must be a standard 1/4 in. diameter three-contact type. The tip connection is for push-to-talk relay control, the ring connector is the microphone terminal, and the sleeve is the common chassis ground. The microphone manufacturer's instructions should be followed in connecting the microphone cable to the plug. With many microphones, the push-to-talk button must be pressed to make the microphone operative. For VOX operation, this feature may be disabled, if desired, by opening the microphone case and permanently connecting the contacts which control the microphone.

EXTERNAL SPEAKER CONNECTIONS

Receiver audio output from the 500-CX is at 4 ohms voice coil impedance. This output is terminated at pin 12 of the Jones Power connector. When using the 117-XC matching power supply, connection is automatically made to the speaker which is built into the supply.

For mobile installations, an external speaker may be connected to pin 12 of the Jones connector. The other speaker terminal goes to pin 6, or chassis ground. The speaker may be any good 4 ohm permanent magnet type in the 4 inch or larger size.

INTERNAL SPEAKER

Provision is made for installation of a standard 3x5 inch speaker inside the 500-CX. This may be desirable particularly in mobile installations. The speaker mounts on the left side of the chassis - terminal lugs are provided near the 6GK6 audio output tube. Simply connect wires from the 2 speaker lugs to these terminals. One is "hot," and the other is ground.

AUXILIARY SWITCHING

A 3 lug terminal strip on back of the 500-CX provides for switching of external accessories. They are marked R, C, and T. R and C are connected when receiving. C and T are connected when transmitting. In particular, terminals C and T are used when the Swan Mark II Linear Amplifier is used.

V6 OUTPUT

A phono type output jack is provided on back of the 500-CX for connecting the antenna system to an auxiliary receiver. Thus, a separate receiver may be used, if desired, with the same antenna system. V6 is the 12BZ6 R. F. amplifier stage in the 500-CX receiver circuit, and it serves as a pre-amplifier for the auxiliary receiver.

CONTROL FUNCTIONS

On-Off Switch (On AF Gain Knob)

Turns power supply on and off

Cal-Rec-Trans-CW-Tune

Calibrate

All voltages are applied to transceiver. Grounds emitters of Q4, Q5, Q6, and Q7. Removes ground from cathode of V14A.

Receive

All voltages are applied to transceiver.

Transmit

12 volt DC circuit through relay K1 and K2 is completed, and tubes used only in receive are biased to cutoff. Meter reads P.A. cathode current.

CW

All circuits for transmit are energized, as above. Capacitor C1501 in the carrier oscillator is removed from ground. Carrier must be inserted with CAR. BAI. control. Meter reads P.A. cathode current.

Tune

Same as CW except that carrier is fully inserted. Meter reads relative output.

Mic. Gain

Controls potentiometer R1402 in the grid of V14A. Controls amount of audio to the balanced modulator.

Car. Balance

Controls potentiometer R1307 in the balanced modulator deflection plate circuit, and permits nulling out the carrier.

RF Gain

Controls variable resistor R1809. Controls gain of receiver mixer, RF Amplifier, and IF Amplifiers.

AF Gain

Controls potentiometer R1201 in grid circuit of V12 AF Output. Controls audio volume.

Main Tuning

Controls C1708 in frequency determining tank circuit of VFO.

CONTROL FUNCTIONS (cont.)

Panel Meter

Reads S-Units in Receive mode, P.A. cathode Ma. in trans. and CW_r mode, and relative output in TUNE Mode.

Main Bandswitch

Switches plate coils, and associated capacitors of VFO, VFO Amplifier, V1, Transmitter Mixer, V2, and Driver, V3. Also switches tank coil of pi-coupling system and associated capacitors in PA output tank.

Output Level

Adjusts meter reading when in TUNE mode. Note that this control has no effect on power output, but determines only the relative meter reading.

Sideband Selector

Selects Normal Opposite sideband. Normal is LSB on 80 and 40 meters, USB on 20, 15 and 10 meters.

PA Bias (Rear Control)

Adjust idling cathode current of Power AMP.

S-Meter Zero (Rear Control)

Adjusts S-Meter to Zero Reading with antenna disconnect.

PTT-VOX

Switch PTT position for press-to-talk operation Vox position for voice control with VX-2 accessory.

ANL

Automatic noise limiter on in right hand position.

CAL. 100KC-25KC

Selects 100KC or 25KC calibration markers.

PA Grid

Controls C1812A and C1812B in plate tanks of transmitter mixer and driver.

PA Tune

Controls C411 on pi-network to tune final power amplifier plate to resonance.

PA Load, Fine

Controls C412 in pi-network to match impedance of output load. Tunes input to Receiver RF Amplifier.

PA Load, Coarse

Switches in progressively more capacitance in parallel with PA LOAD, Fine.

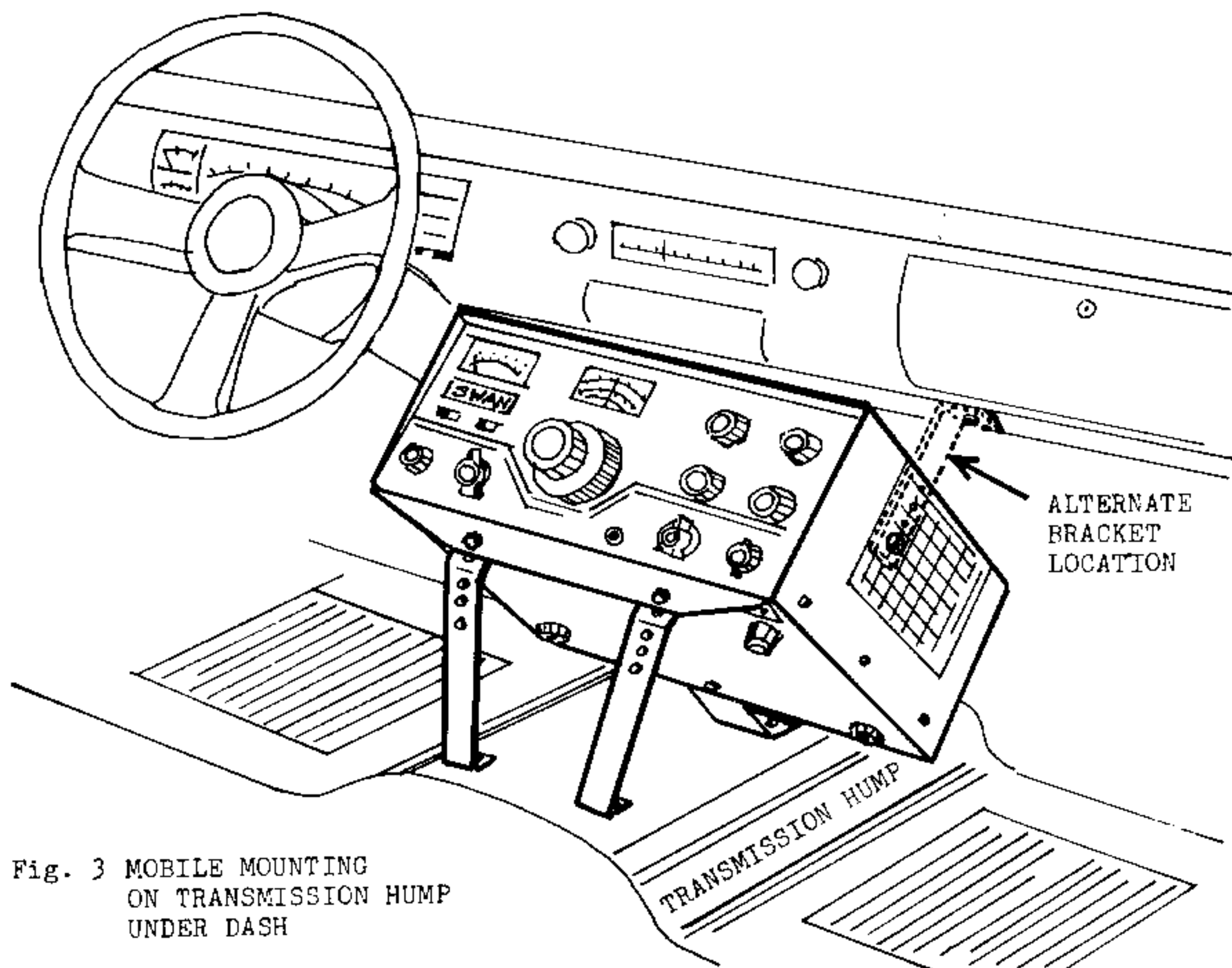
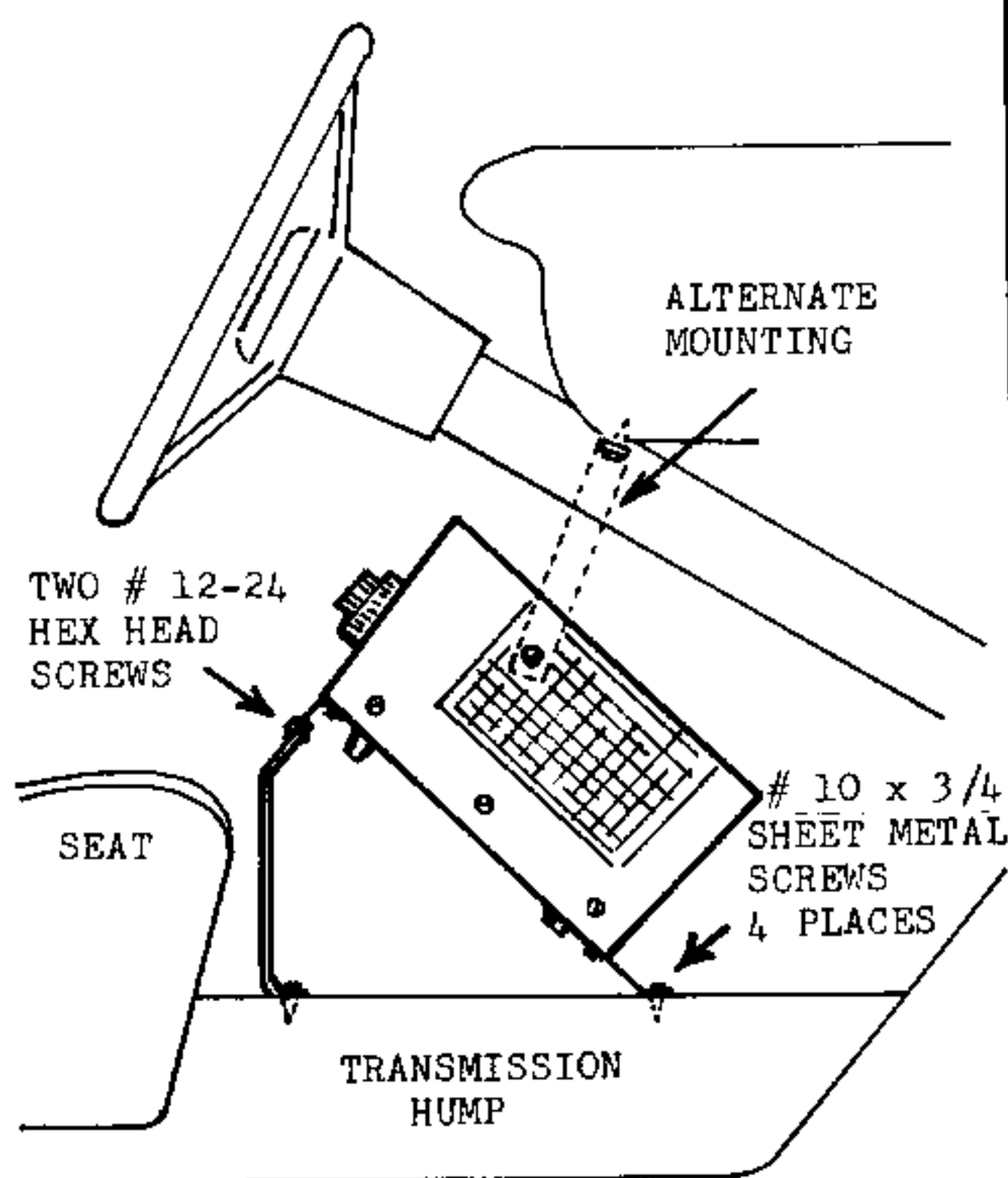
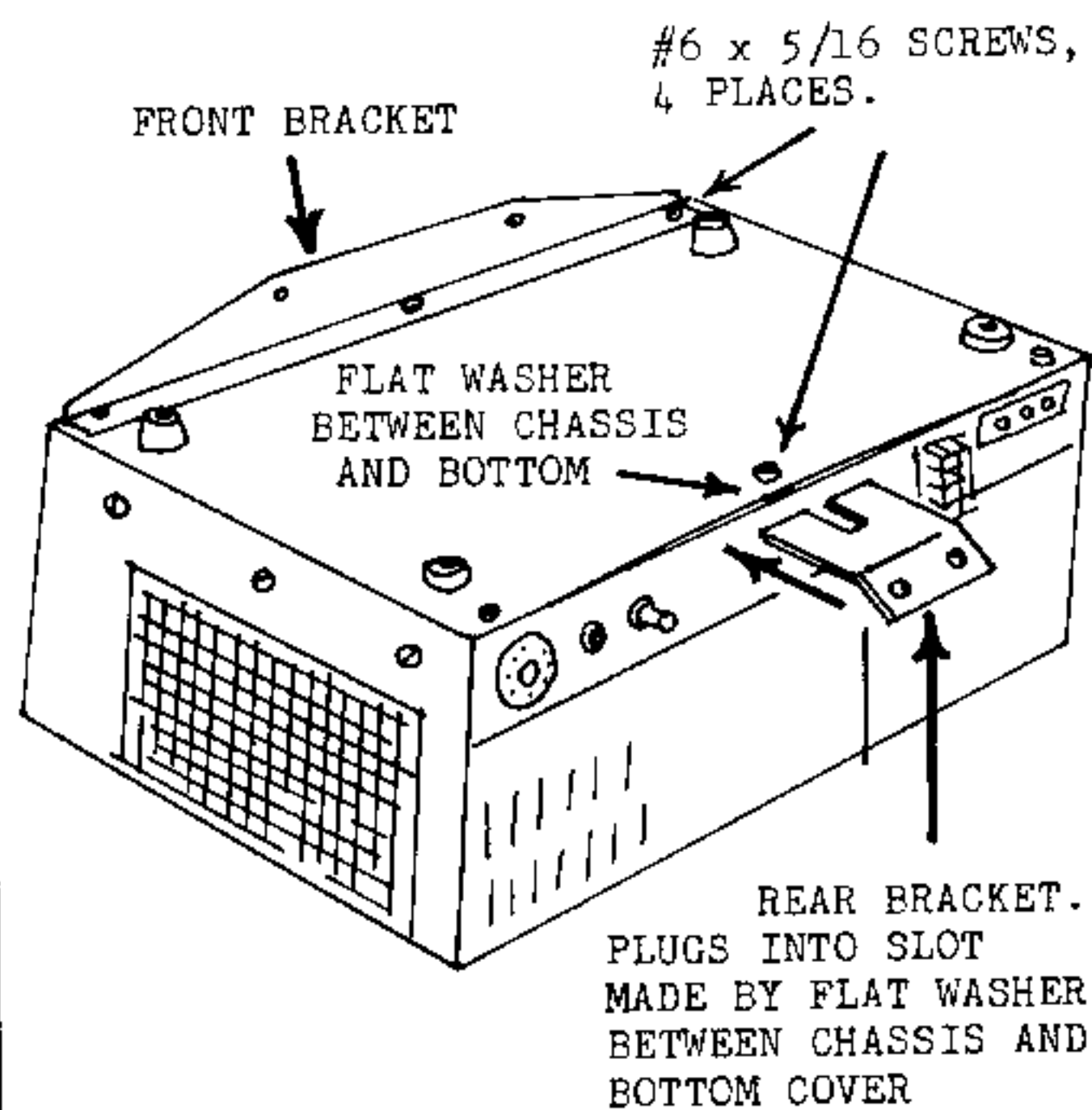


Fig. 3 MOBILE MOUNTING
ON TRANSMISSION HUMP
UNDER DASH



MOBILE MOUNTING, SIDE VIEW



TRANSCIEVER, BOTTOM VIEW

C. OPERATION

Before connecting any cables to the Swan 500-CX perform the following steps:

1. Rotate the CAL-REC-TRANS-CW-TUNE switch on the lower left of the front panel counterclockwise to REC.
2. Rotate the AF GAIN control counterclockwise to OFF.
3. Connect wire from earth ground to ground stud provided on rear of chassis.
4. Connect a 50 to 75 ohm antenna feed-line to the coaxial connector on the rear chassis panel.
5. Connect the power supply cable to the Jones connector on the rear chassis.
6. Connect the power supply to the proper voltage source.

WARNING

Dangerous high voltage is present on the plate of the power amplifier whenever the power supply is energized. Never turn power on when the power amplifier cover is removed. High voltage is also present at Pin eight of the power plug.

RECEIVER

In RECEIVE position, or at any time when the transmitter is not in TRANSMIT, all circuits used in transmitting are disabled through the relay controlled circuits, K1, K2. The relays are energized for transmitting and de-energized for receiving. Relay K2, when de-energized, allows signals from the transmitting tank circuit and antenna to be fed to the receiver RF Amplifier, V6, where they are amplified and then fed to the control grid of the Receiver Mixer, V7. The local oscillator signal from the VFO Amplifier is now used to heterodyne the received signal to the IF frequency. All IF amplification is accomplished at this frequency, nominally 5500.0 kc, through V8 and V9 IF amplifiers. In the Product Detector V10A, the IF signal is heterodyned with the carrier frequency generated by Carrier Oscillator, Q3. The resultant audio signal is then put through a noise clipper network which is in or out of circuit by selection of ANL switch. The signal is then amplified by V10B, which then couples to V11, the AGC Amplifier, and V12, the output audio stage.

RECEIVER OPERATION

1. Rotate the AF GAIN control clockwise to about the 3 o'clock position. The power switch will operate applying filament, relay, bias, medium, and 800 volt high voltage to the transceiver.

2. Wait approximately one minute to allow the tube filaments to reach operating temperature. During this period, perform the following steps:

- a. Rotate the BANDSWITCH to desired band.
- b. Rotate MIC. GAIN fully counterclockwise.
- c. Rotate CAR. BAL. control to the mid-scale position, with white dot on knob aligned with the long index mark on the panel.
- d. Preset PA PLATE control to mid-position.
- e. Preset PA GRID control to mid-position.
- f. Preset PA LOAD FINE to mid-position.
- g. Preset PA LOAD COARSE to position 1.
- h. Set tuning dial to desired frequency.
- i. Set RF GAIN control to approximately 3 o'clock position.

3. Carefully adjust the PA GRID and the PA PLATE controls for maximum receiver noise. NOTE: The PA GRID control resonates the transmitter driver stages and the receiver RF amplifier plate circuit. The PA PLATE and PA LOAD controls adjust the input and output capacitors in the transmitter power amplifier final plate circuit, as well as the receiver RF amplifier grid circuit. Proper adjustment of these controls in the receiver position will result in approximately resonant conditions in the transmitter stages.

RECEIVER TUNING

The tuning dial of the 500-CX has a green tinted scale reading from zero to 450 which is used on 40, 20 and 15 meters. Above the green scale is a separate calibration for 80 meters, reading from 3500 to 4000 KC. Below the green scale is the 10 meter scale, reading from 28 to 29.7 MC.

Precise tuning of a single sideband signal is very important. Do not be satisfied to merely tune until the voice can be understood, but take the extra care of setting the dial to the exact spot where the voice sounds natural. Above all, avoid the habit of tuning so that the voice is pitched higher than normal. This is an unfortunate habit practiced by quite a number of operators. The following points help to explain the effects of mistuning:

1. If you tune so the received voice is higher than normal pitch, you will then transmit off frequency, and your voice will sound lower than normal pitch to the other station. He will probably retune his dial to make you sound right. If you keep this up, you will gradually waltz one another across the band. If both of you are mistuning to an unnatural higher pitch, you will waltz across the band twice as fast. (And someone will no doubt be accused of frequency drift.)
2. Mistuning results in serious harmonic distortion on the voice, and should be quite noticeable to the average ear. Some will claim that if they don't know how the other person's voice actually sounds, they can't

RECEIVER TUNING (cont.)

tune him in properly, but this is not true. With a little practice, it is fairly easy to tell. Some voices are relatively rich in harmonics, and are easier to tune in than a person with a "flat" voice. Also, a transmitter which is being operated properly with low distortion will be easier to tune in than one which is being over-driven and is generating excessive distortion. There is no mistaking when you have a station tuned right on the nose. It will sound just like "AM," so to speak. Mainly, avoid the habit of tuning so everyone sounds higher than normal pitch, or like Donald Duck. This is incorrect, unnecessary, and sounds terrible.

3. A vernier control for receive frequency, sometimes referred to as "incremental tuning," is not available on the Swan 500-CX. Such a device is not necessary if proper tuning habits are exercised.

4. Your Swan 500-CX will automatically transmit on exactly the same frequency as the one to which you are listening. There is no adjustment for making them the same, since by using the same oscillator for both send and receive, it happens automatically. If separation of receive and transmit frequency control is desired, the Model 508 VFO unit may be used.

TRANSMITTER

Power Rating

The Swan 500-CX is capable of 400 watts, PEP input under steady state two-tone test conditions, when operated with any of the recommended power supplies. The peak envelope power, when voice modulated, is considerably greater, typically 550 watts, or more.

Recommended power supplies produce a no-load plate voltage of approximately 925 volts. Under TUNE conditions, or CW operation, this voltage will drop to approximately 720 volts. Under steady state two-tone modulation, the voltage will drop to approximately 750 volts. If the power amplifier idling current is 50 ma, and the two-tone current, just before flat-topping, is 400 ma, the peak two-tone current will be 600 ma. Under these conditions the PEP input will be 750 volts time 600 ma = 450 watts. Under voice modulation, because average power is considerably less, the power amplifier plate and screen voltages will be maintained higher, even during voice peaks, by the power supply filter capacitors. Peak plate current will therefore also be higher than with two-tone test conditions. Under typical operating conditions, peak plate current before flat-topping will be 70 ma at 800 volts, to result in an input of 560 watts, PEP. Readings of cathode current will not reflect this 560 watt power input, however, because of the damping in the cathode current meter. Cathode current readings under normal voice input should not exceed approximately 200 ma.

POWER AMPLIFIER PLATE DISSIPATION

There is often a misunderstanding about the plate dissipation of tubes operated as AB1 amplifiers under voice modulation. In the Swan 500-CX, while in the transmit

position, and with no modulation, the plate voltage will be 890 volts, the plate current 50 ma, and the power input will be at 45 watts.

Average voice power is from 10 to 20 db below peak voice power. Normally some peak clipping in the power amplifier can be tolerated, and a peak-to-average ratio of only 6 db may sometimes occur. Under such conditions, the average power input will be 125 watts, and average plate current will be 156 ma. With power amplifier efficiency of 65 percent, plate dissipation will be 44 watts, or 22 watts per tube. The 6LQ6 is rated at 30 watts, continuous duty cycle, in normal TV service. Thus it can be seen that under normal operating conditions, the power amplifier tubes in the Swan 500-CX are not being driven very hard. Note, however, that proper modulation level must be maintained by correct setting of Mic. Gain, and that the length of time in TUNE position should be limited to not more than 30 sec. at a time.

TRANSMITTER TUNING

Special Notes: Read carefully. Be sure that you understand and remember these notes when tuning the transmitter.

1. The most important detail to keep in mind when tuning the transmitter portion of your Swan transceiver is that the P.A. PLATE *must be resonated as quickly as possible!* The P.A. tubes are dissipating all the power input when they are not in resonance, and can be permanently damaged in just a few seconds. Once resonance has been established, the P.A. tubes can operate at full power input for a considerable length of time, although we recommend 30 seconds as a safe maximum. But, it is most important to realize that the 30 second limit assumes that the P.A. PLATE has been *immediately* resonated. This rule applies generally to all transmitters.

2. P.A. PLATE resonance may be accomplished by (1) tuning for the "dip" in P.A. cathode current, or (2) tuning for maximum transmitter output, depending on which circuit is being metered.

3. In the 500CX you are reading P.A. cathode current when in Press-To-Talk, TRANS., or CW mode, so P.A. PLATE must always be tuned for the "dip" in meter reading when in any of these modes.

4. When the 500CX Function Switch is in "TUNE" mode, the meter circuit is automatically switched to indicate transmitter output level, so P.A. PLATE must always be tuned for maximum meter reading when in "TUNE" mode.

Read items (3) and (4) over carefully to be sure you understand.

5. The OUTPUT LEVEL control located on the right hand side of the panel meter adjusts the meter reading to a convenient level when in "TUNE" mode. It is important to realize that this control has no effect whatsoever on transmitting power. It is required because of wide variations in meter readings caused by various antenna loads, and different frequency bands.

TRANSMITTER TUNING (cont.)

When in "TUNE" mode, the meter reading is strictly a relative indication of power output.

6. When first tuning the 500CX, you may find the 30 second time limit too short. In that event, switch back to REC mode for a minute or so, and then resume tuning procedures. With experience, transmitter tuning will require only 10 to 15 seconds. Do not tune more often than necessary. You should not have to retune except when changing bands or antennas. The P.A. tubes will last for many months or even years of normal operating, but constant tuning at full grid drive will shorten their life considerably.

7. **Caution:** The 500CX may be tuned to frequencies outside the amateur bands. Do not tune or operate the transmitter unless you are within your permitted band limits.

TUNING STEPS:

1. The Sideband Selector must be in "NORM" position during transmitter tuning procedures. Bandswitch and tuning dial set to desired frequency. MIC. GAIN at minimum, CAR. BAL. straight up, 12 o'clock.
2. Move the function Switch to TRANS. mode, and quickly rotate the CAR. BAL. control for minimum meter reading. If the control has no effect at this time, do not be concerned. The P.A. (Power Amplifier) stage is now "resting" or "idling," and there is no grid drive being applied. The meter is reading "idling" current, which should be about 50 ma. as read on the 800 ma. scale. The permissible idling range is between 40 and 60 ma. If the P.A. is idling above or below this range, adjust the P.A. Bias control on back of the chassis.
3. If this is the first time you are tuning the transmitter, set the COARSE LOAD control to position 4. (After experience in tuning, this control may be set to whatever position has been found optimum on each respective band.)

Note: Up to now, the transmitter has been merely "idling," and there has been no particular time limit involved. The following step begins applying grid drive, and requires caution and observation of the recommended 30 second time limit.

4. With the Function Switch still in TRANS. mode:
 - a. Set the CAR. BAL. control to either ~~9 o'clock~~ or ~~3 o'clock~~, **FULL CLOCKWISE POSITION**
 - b. Rotate the P.A. GRID control for maximum meter reading.
 - c. *Immediately* rotate the P.A. PLATE control for minimum meter reading, or "dip." This is the critical adjustment known as "resonating" the plate circuit, and *must be performed quickly* to preserve P.A. tube life!
 - d. Re-adjust CAR. BAL. for minimum meter reading.
5. Switch to TUNE position and quickly adjust P.A. PLATE and P.A. LOAD controls for maximum meter reading.

- a. If the meter goes off scale, use the OUTPUT LEVEL control to bring it back to about midscale.
- b. Advance the COARSE LOAD control clockwise a step at a time, readjusting P.A. PLATE each time, until the position for maximum output is found. Use the FINE LOAD control for vernier load adjustment. Each time a change in either load control is made, the P.A. PLATE must be re-tuned.
- c. Switch back to REC. position.
- d. Once the proper settings have been found, make notes on a card so they can be quickly re-set each time you change bands.

6. **Voice Transmission.** After tuning up as outlined above, switch to TRANS. position and then carefully set the CAR. BAL. control for minimum meter reading. Carrier balance will usually occur with the CAR. BAL. somewhere around mid-range, but the setting is not important or significant, as long as a null can be observed. While speaking into the mike, slowly rotate the MIC. GAIN control until occasional peak readings of 200 to 225 ma. are obtained. With most microphones, the MIC. GAIN control will be set between 9 and 12 o'clock, but it may vary considerably. The amplified ALC circuit will help limit cathode current to about 225 ma., but turning the MIC. GAIN up too high will still produce flat topping and spurious signals, so it is important to hold it down. The meter is quite heavily damped, and its reading with average voice modulation may not look very impressive, but the voice peaks are going well over the 550 watt power rating of your Swan transceiver. NOTE: Transceiver will not modulate with Function Switch in CAL. position.

7. AM Operation (Single Sideband With Carrier)

- a. Tune transmitter to full output on single sideband as described above.
- b. Rotate MIC GAIN control to minimum, full CCW.
- c. With Push-to-talk pressed, rotate CAR. BAL. control until cathode current is approximately 150 ma.
- d. While talking in a normal tone of voice into the microphone, increase MIC. GAIN setting until the meter kicks upward slightly. This setting will result in excellent AM transmission.

8. CW Operation

- a. Insert a CW Key in the Key Jack on back of the 500-CX Transceiver.
- b. After tuning up for maximum output as outlined in Step 5, switch to CW mode, press the key, and insert carrier by rotating the CAR. BAL. control until the meter indicates a P.A. Cathode Current of 450 ma. Power input will then be the rated 360 watts. It may be reduced to whatever level is required to maintain contact. Full power level is not

TRANSMITTER TUNING (cont.)

always necessary. NOTE: PTT-VOX switch must be in PTT position.

c. In Manual CW operation it will be necessary to switch the Function control back to REC. for receiving and then to CW for transmitting.

d. Semi-break-in CW

When the VOX accessory, model VX-2 is used, Break-In operation may be employed. Move the PTT-VOX switch to VOX position, and rotate the Function control to CW mode. Rotate the VOX GAIN and the ANTI-TRIP control on the VX-2 to full counterclockwise position. Press the CW key to transmit. When you stop keying the circuits will automatically switch back to receive mode. Adjust the VX-2 DELAY control to the position which gives the desired delay time in returning to Receive.

e. Off-set CW Transmit Frequency:

While receiving, the carrier oscillator frequency is located 300 cycles outside the passband of the crystal lattice filter, thus providing a single heterodyne note, or "single-signal" for CW reception. When transmitting in CW mode, the carrier frequency is moved approximately 800 cycles higher, placing it well inside the passband. This frequency shift is termed "Off-set CW transmit frequency," and avoids the problems encountered when the receive and transmit frequency are exactly the same. When receiving CW, the receiver must be tuned off frequency several hundred cycles in order to hear an audio beat. By providing this shift automatically in the 500-CX, CW operation is greatly simplified.

Sidetone Oscillator

A sidetone oscillator circuit is included in the 500-CX, and permits CW monitoring. An 800 cycle tone will be heard coming from the speaker or headphones. The strength, or volume of the tone may be changed if desired by changing the resistance value of R1202 in the sidetone circuit. Note that the A.F. GAIN control will have some effect on the sidetone.

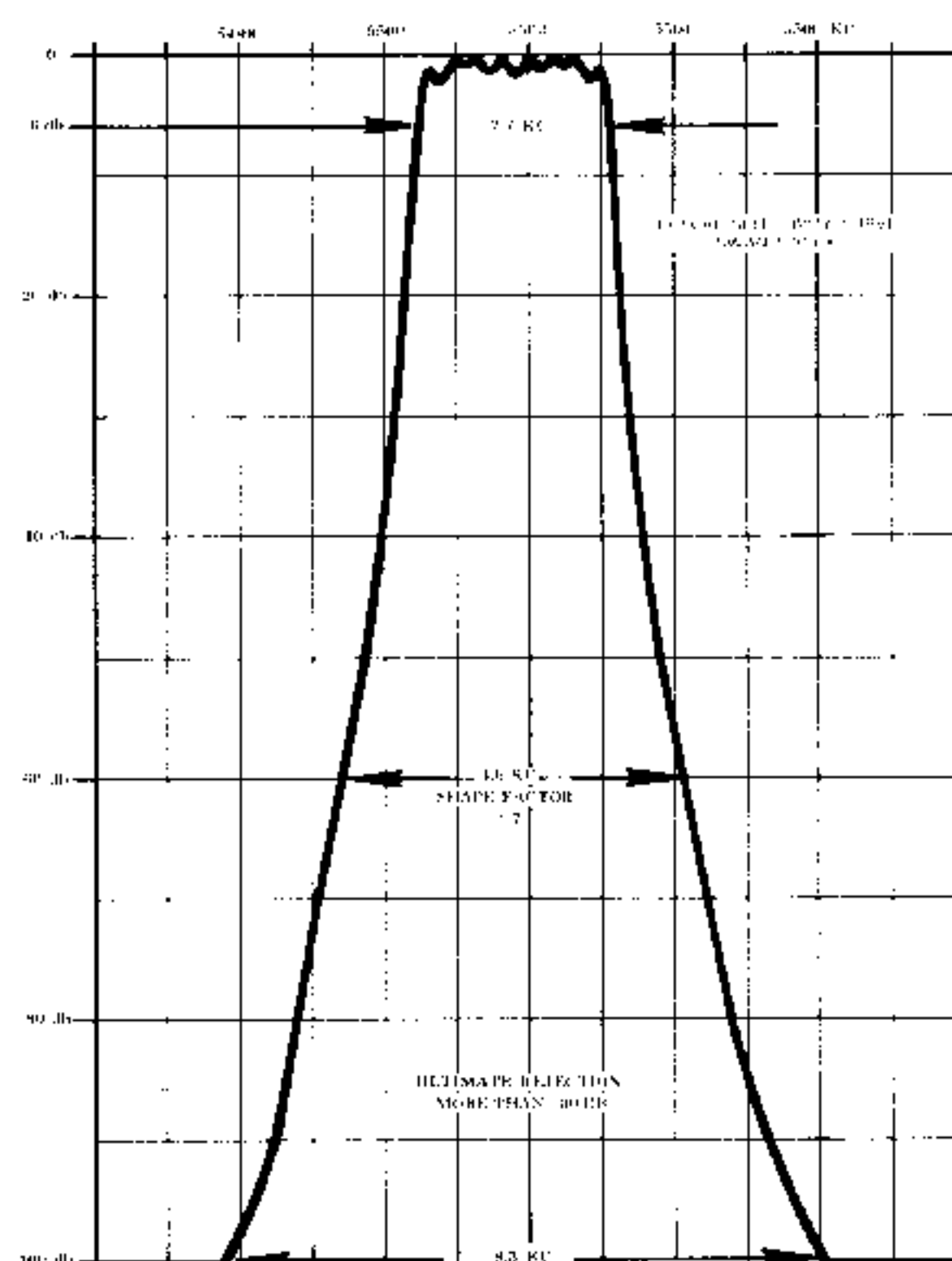
Narrow Band CW Filter:

The Swan model AF-800 is available for use with the 500-CX. It is a double toroid, high Q filter tuned to 800 cycles, and installs inside the 117-XC matching power supply. See the accessory section for further information.

9. After tuning for maximum output, it will be useful to know how much cathode current the P.A. is drawing at full power input. This will help indicate condition of the P.A. tubes, as well as the driver stage and other tubes in the transmitter circuitry.

a. This may be done by switching to CW mode, and inserting full carrier with the CAR. BAL. control. The key jack circuit must be closed by a CW key for this test.

b. Alternately, you can check P.A. cathode current by whistling a steady tone into the microphone. It will be found that cathode current is typically 500 ma. or more on the lower bands, but will be somewhat lower on 10 and 15 meters, typically between 400 and 450 ma. Several factors can affect cathode current, including AC input voltage, (or DC voltage in mobile use) tube condition, and circuit alignment. The reading should be used primarily as an indication of gradual change, or deterioration.



**FIG. 4 CRYSTAL FILTER
TYPICAL CHARACTERISTIC**

D. ALIGNMENT AND TROUBLESHOOTING

The following procedures are given in the order performed during the factory alignment for the transceiver. For home servicing, only partial alignment may be necessary. Read all procedures carefully before commencing either partial or complete alignment. See figures and for component placement. The following equipment will be required for complete alignment:

1. Audio Signal Generator
2. 500 watt dummy load with output meter
3. Vacuum tube voltmeter
4. Field strength meter

RECEIVER ALIGNMENT

Receiver alignment involves only the adjustment of the Second IF coil and the 10 meter receiver coil. The 15, 20, 40 and 80 meter coils which affect receiver performance are also used in transmit mode. Their adjustment is covered under "Transmitter Alignment."

1. After allowing one minute for warm-up tune the receiver to the middle of either 15, 20, 40 or 80 meters and at a clear frequency.
2. Adjust the P.A. PLATE, P.A. GRID and P.A. LOAD front panel controls for maximum background noise.
3. Adjust IF coil L901 for maximum background noise.
4. Switch to the center of 10 meters and adjust L105 for maximum background noise.

TRANSMITTER ALIGNMENT

The alignment of transmitter circuits involves the adjustment of tuned circuits in the VFO amplifier, V1, the Transmit Mixer, V2 and Driver stage, V3. A dummy load should be connected to the antenna jack during this series of adjustments.

VFO Amplifier Plate Circuit

With VTVM from pin 1 of V7, Receiver Mixer, to ground, on -15 volt scale, adjust VFO Amplifier Plate coils for peak VTVM reading as follows:

Band	VFO Frequency (kc)	Dial Frequency (kc)	Coil
80	9,300	3,800	L104
40	12,625	7,125	L103
15	15,725	21,225	L102
10	23,000	28,500	L101

Transmitter Mixer and Driver Plate Circuit

1. Adjust P.A. BIAS control fully counterclockwise (maximum bias).

2. Loosely couple field strength meter to C308 (off pin 2 of V4) with alligator clip on ceramic capacitor body.
3. Remove screen voltage from V4 and V5 by disconnecting the wire from terminal strip immediately adjacent to V5 base. (Point A, Fig. 5).
4. Connect VTVM across R401, 1K resistor between pins 1 and 2 of terminal strip, using 25 volt scale. (Points B and C, Fig. 5).

PROCEDURE

Adjust bandswitch and P.A. Grid as shown below, and adjust coils for peak VTVM reading, with function switch in TUNE position:

Band	P.A. Grid	Dial Freq.	Adjust	
80	12 O'clock	3800	L 206	L 305
40	11 O'clock	7150	L 204	L 304
20	11 O'clock	14150	L 205	L 303
15	2 O'clock	21450	L 202	L 302
10	2 O'clock	29.0	L 203	L301

Note: If VTVM and field strength meter exceed full scale reading, switch to REC position, actuate push-to-talk circuit, and insert carrier with carrier balance control to keep reading on scale. Field strength meter and VTVM must both peak at same time since it is possible to tune the coils to the VFO frequency on 10 meters. Care must be taken that the coils be tuned properly. Following the above procedures, replace screen wire to pin 1 of terminal strip adjacent to V5.

Carrier Frequency Adjustment

1. Tune up on the 20 meter band into a dummy load. Balance out the carrier and adjust the P.A. Bias for 50 ma.
2. Feed 1500 cycles of audio from the Audio Generator into the MIC input receptacle. Adjust the gain of the audio generator and the MIC GAIN control until the wattmeter reads about 10 or 15 watts.
3. Adjust both slugs of the Balanced Modulator transformer (T1301) for maximum output.
4. Adjust the First IF coil (L801) for maximum output.
5. Increase the gain of the audio generator until the wattmeter reads 40 watts. Sweep the audio generator down to 300 cycles. Adjust the Normal Sideband Carrier Oscillator trimmer (C1502) for a reading of 10 watts.
6. Switch to Opposite Sideband and adjust carrier oscillator trimmer (C1503) for 10 watts.
7. Re-check with audio generator set at 1500 cycles and 40 watts. Sweep down to 300 cycles and re-adjust Carrier Oscillator Trimmer capacitors, if necessary, for 10 watts input.

P.A. NEUTRALIZATION

With P.A. coarse load in position 1, set freq. to 14,150, PA Plate control at 9 o'clock, insert carrier and peak P.A. Grid control, adjusting Car. Bal. control for 200 MA. Turn P.A. control slowly through resonance. Cathode current should dip smoothly and rise to 200 MA on the low capacity side of resonance. If, instead, there is a peak above 200 MA either side of the dip, stop rotation of the P.A. plate control at the peak and adjust C406 to reduce Ip to 200 MA. Repeat above check and re-adjust as necessary to obtain the desired smooth dip. For 10 meters, use above procedure but adjust #C312.

VFO ALIGNMENT

A trimmer condenser is provided for each VFO range. Trimmer adjustment for the five VFO ranges is through top cover of the VFO compartment. An insulated adjusting tool is recommended. Dial tracking has been factory set by pruning the coil, and will not ordinarily require further adjustment.

When dial calibration changes beyond the adjusting range of the front panel dial set control, calibration may be restored by carefully adjusting the trimmer for that range.

EXAMPLE:

The 40 meter band at 7000 KC point is off frequency approximately 8 KC on the high side and cannot be restored by adjusting dial set on front panel.

1. Set dial set to twelve o'clock position.
2. Set VFO at 7008 KC so as to hear 100 KC Calibrator.
3. With an insulated alignment tool in one hand and the VFO dial in the other, rotate the dial a small amount at a time down towards the 7000 KC point, but not enough to lose the 100 KC signal. Now rotate the trimmer so as to zero beat the 100 KC signal. Again rotate the dial a small amount down the band so you still hear the calibrator, stop and with trimmer rezero beat the signal again. Repeat these steps until you have reached 7000 KC point on the dial. Use caution so you do not lose the 100 KC signal. This will prevent you from aligning on the wrong 100 KC note which would put the VFO off frequency by a 100 KC. The following chart lists the actual oscillating frequency of the VFO at band edges.

FREQUENCY CALIBRATION

Frequency calibration of the Model 500-CX is in 5 kc increments on 80-, 40-, 20-, and 15- meters, and 20 kc increments on 10 meters. 80 meters is calibrated directly on the upper dial scale. 40-, 20-, and 15- meters are calibrated from zero to 450 on the green tinted center scale. "EXAMPLE": The dial is set at 200 on the green scale. (On 40 meters this would read 7.2 mc; on 20 meters this would read 14.2 mc, and on 15 meters this would read 21.2 mc.) 10 meters is calibrated directly on the lower dial scale. Dial accuracy and tracking are quite

VFO Frequency Chart

Dial Frequency	Oscillator Frequency
3500 KC	9000 KC
3800	9300
4000	9500
7000	12,500
7200	12,700
7300	12,800
14,000	8500
14,200	8700
14,350	8850
21,000	15,500
21,250	15,750
21,450	15,950
28,000	22,500
28,500	23,000
29,000	23,500
29,700	24,200

good on the 500-CX, but caution must always be observed when operating near band edges. Measuring the frequency with the calibrator when working near band edges is recommended.

DIAL SET

A dial-set control has been provided so that dial adjustment can be made at any 100 or 25 KC point of the dial. With calibrator on, set the dial to any 100 or 25 KC point closest to the frequency you wish to work. Now adjust dial-set control to zero-beat the VFO with the calibrator. This provides greater accuracy of dial read-out.

CAUTION: Care must be exercised when tuning for the 100 or 25 KC harmonics of the calibrator. Spurious image signals may be heard, although they will be somewhat weaker than the actual harmonics.

CRYSTAL CALIBRATOR FREQUENCY ADJUSTMENT

Adjustment of the Crystal Calibrator must be made with an outside source, such as an external receiver that will tune to WWV. Remove transceiver cabinet and bottom. Locate the R.F. Amplifier tube socket, V6. Wrap one end of an insulated wire lead loosely around Pin 1. Connect the other end to the antenna terminal of the external receiver. Tune external receiver to zero beat WWV. Now turn on calibrator in 500-CX (either 100 or 25 KC position) and by listening to it on the external receiver, adjust trimmer capacitor C1603 (located on top of chassis next to 100 KC crystal) to zero beat with WWV.

25 KC MULTIVIBRATOR ADJUSTMENT

The calibrator circuit board, located underneath the chassis has a trimmer type potentiometer which is used to adjust the multivibrator circuit so it divides the 100 KC calibrator output by a factor of 4, thus providing calibration markers every 25 KC. If markers are received every 20 KC, or every 33-1/3 KC, adjustment is required. Use a small screwdriver, and carefully turn the control to the location where calibration markers are properly received. An oscilloscope may also be used as an aid, if available.

S-METER ADJUSTMENT

With antenna disconnected and with RF Gain fully clockwise, set R906, located on rear panel, for zero meter reading. Make sure no local signals are being received.

CARRIER BALANCE

A carrier balance control is provided on the front panel, and is labeled CAR. BAL. This control permits insertion of carrier during CW operation for power control, as well as carrier insertion for AM operation, and as an aid in tuning the transmitter circuits. In addition to the carrier control, there is another located under the chassis near the balanced modulator tube socket, V 13, the 6JH8. This control is called a "Quadrature control," and is of the screwdriver adjust, trimmer type. It will seldom require adjustment, but is recommended particularly when if the 6JH8 tube is replaced. A dummy load must be connected to the transceiver. Connect a sensitive VTVM across the dummy load, or across the coax. line. First tune for maximum output in normal manner. Then switch to TRANS. mode, and balance carrier with CAR. BAL. panel control. Finally, adjust trimmer, the Quadrature control, for carrier null.

L601 TRAP ADJUSTMENT

Set bandswitch to 14 mc range. Feed strong 11.9 mc signal from signal generator into antenna jack. Tune around 14,225 until signal is found. Adjust L601 for minimum.

E. PARTS LIST

CAPACITORS

C101	.002, 20% 500V Disc
C102	.01, 80-20% 500V Disc
C103	.002, 20% 500V Disc
C104	10, 5% 500V Mica
C105	30, 5% 500V Mica
C106	.01, 80-20% 500V Disc
C107	.01, 80-20% 500V Disc
C201	.1 mf, 200V Tubular
C202	.01, 80-20% 500V Disc
C203	.002, 20% 500V Disc
C204	82, 5% 500V Mica
C205	100, 5% 500V Mica
C206	24, 5% 500V Mica
C207	1000, 5% 500V Mica
C208	20, 5% 500V Mica
C209	20, 5% 500V Mica
C210	50, 5% 500V Mica
C211	3.3 pf, 10% 500V Ceramic
C301	.01, 80-20% 500V Disc
C302	75, 5% 500V Mica
C303	100, 5% 500V Mica
C304	100, 5% 500V Mica
C305	24, 5% 500V Mica
C306	50, 5% 500V Mica
C307	.002, 20% 500V Disc
C308	.002, 20% 500V Disc
C309	.01, 80-20% 500V Disc
C310	91, 5% 500V Mica
C311	15, 20% 3KV Disc
C312	1.5-20 pf Mica Trimmer
C313	270, 5% 500V Mica
C314	3.3 pf, 3KV Disc
C315	680, 5% 500V Mica
C316	50, 5% 500V Mica
C317	510, 5% 500V Mica
C318	100, 5% 500V Mica
C319	510, 5% 500V Mica
C320	330, 5% 500V Mica
C401	.002, 20% 500V Disc
C402	.01, 80-20% 500V Disc
C403	.01, 80-20% 500V Disc
C404	.01, 80-20% 500V Disc
C405	.01, 80-20% 500V Disc
C406	20 pf PA Neut. Trimmer
C407	270, 5% 2500V Mica
C408	270, 5% 2500V Mica
C409	.002, 20% 2KV Disc
C410	100, 10% 6KV Disc
C411	360 pf PA Plate
C412	410 pf PA Fine Load
C413	150, 10% 1500V Mica
C414	150, 10% 1500V Mica
C415	330, 10% 1000V Mica
C416	330, 10% 1000V Mica
C417	330, 10% 1000V Mica
C418	330, 10% 1000V Mica

C419	.002, 20% 500V Disc
C420	.01, 80-20% 500V Disc
C601	120, 5% 500V Mica
C602	5, 5% 500V Disc
C603	.01, 80-20% 500V Disc
C604	.01, 80-20% 500V Disc
C701	.001, 20% 500V Disc
C702	30, 10% 500V Disc
C703	.01, 80-20% 500V Disc
C704	430, 5% 500V Mica
C705	220, 5% 500V Mica
C801	68, 5% 500V Disc
C802	.01, 80-20% 500V Disc
C803	.01, 80-20% 500V Disc
C804	10 pf
C901	.01, 80-20% 500V Disc
C902	.01, 80-20% 500V Disc
C903	.01, 80-20% 500V Disc
C1001	150, 5% 500V Mica
C1002	220, 20% 500V Disc
C1003	.002, 20% 500V Disc
C1004	.002, 20% 500V Disc
C1005	500, 20% 500V Disc
C1101	500, 20% 500V Disc
C1102	.01, 80-20% 500V Disc
C1103	.001, 20% 500V Disc
C1104	.001, 20% 500V Disc
C1105	.001, 20% 500V Disc
C1201	220, 20% 500V Disc
C1202	.01, 80-20% 500V Disc
C1203	.001, 20% 500V Disc
C1204	.002, 20% 500V Disc
C1205	.001, 20% 500V Disc
C1206	.001, 20% 500V Disc
C1207	.01, 10% 1000V Tubular
C1301	.01, 80-20% 500V Disc
C1302	.01, 80-20% 500V Disc
C1303	.01, 80-20% 500V Disc
C1304	.01, 80-20% 500V Disc
C1305	220, 20% 500V Disc
C1306	.01, 80-20% 500V Disc
C1401	.01, 80-20% 500V Disc
C1402	.01, 400V Tubular
C1403	.01, 80-20% 500V Disc
C1404	100, 20% 500V Disc
C1405	.01, 80-20% 500V Disc
C1501	10, 5% 500V Mica 15 pf
C1502	1.5-20 pf Mica Trimmer
C1503	4-40 pf Mica Trimmer
C1504	.002, 20% 500V Disc
C1505	270, 5% 500V Mica
C1506	270, 5% 500V Mica
C1507	.01, 80-20% 500V Disc
C1601	250 mf 20VDC
C1602	390, 5% 500V Mica
C1603	5-80 pf Mica Trimmer
C1604	.01, 10% 500V Disc

C1605	.002, 10% 500V Disc
C1606	50, 5% 500V Mica
C1701	470, 5% 500V Mica
C1702	270, 2% 500V Mica
C1703	430, 2% 500V Mica
C1704	27, 5% 500V Mica
C1705	430, 2% 500V Mica
C1706	.01, 80-20% 500V Disc
C1707	2 pf Dial Set
C1708	12 pf Main Tuning
C1709	22 Disc, Neg Selected
C1710	2.5 Disc, Neg Selected
C1711	6.7 pf Trimmer
C1712	39 Disc, Neg Selected
C1713	20 Disc, Neg Selected
C1714	11.6 pf Trimmer
C1715	10 Disc, Neg Selected
C1716	10 Disc, Neg Selected
C1717	11.6 pf Trimmer
C1718	10 Disc, Neg Selected
C1719	30 Disc, Neg Selected
C1720	11.6 pf Trimmer
C1721	10 Disc, Neg Selected
C1722	5 Disc, Neg Selected
C1723	11.6 pf Trimmer
C1801	.002, 20% 2KV Disc
C1802	.001, 1KV Feedthru (7)
C1803	80 mf 150VDC
C1804A	40 mf 450VDC
C1804B	40 mf 450VDC
C1805	10 mf 150V
C1806	.01, 80-20% 500V Disc
C1807	.01, 80-20% 500V Disc
C1808	.47, 20% 200V Tubular
C1809	.05, 10% 200V Tubular
C1810	.05, 10% 200V Tubular
C1811	.002, 20% 500V Disc
C1812A	135 pf PA Grid
C1812B	135 pf PA Grid
C1813	20 mf 25VDC

RESISTORS

R101	82 ohms
R102	56 ohms
R103	47K - 1 watt
R104	4.7K
R105	2.2K
R106	12K - 2 watt
R107	1K
R108	68 ohms - 1 watt
R201	27K
R202	27K
R203	18K - 2 watt
R204	6.8K
R205	6.8K
R206	6.8K

Capacitors are in Picofarads when listed as a whole number. When listed as decimal number value is in microfarads. Unless otherwise specified. Resistors are 10% tolerance, and ½ watt rating, unless otherwise specified.

R207 4.7K - 1 watt
 R301 270K
 R302 100K
 R303 100 ohms
 R304 10K
 R305 8.2K
 R306 10K
 R401 1K
 R402 10K Bias Pot.
 R403 10K - 1 watt
 R404 1 ohm - 5% - 2 watt
 R405 470 ohms - 5%
 R406 680 ohms - 5%
 R407 1 ohm - 5% - 2 watt
 R408 100 ohms
 R409 100 ohms
 R410 1K
 R411 10K
 R412 100K Output Level Pot.
 R601 100K
 R602 56 ohms
 R603 47K - 1 watt
 R701 47K
 R702 27K
 R703 18K - 2 watt
 R801 10 Meg
 R802 33K - 2 watt
 R803 1K
 R901 270K
 R902 100 ohms
 R903 47 ohms - 5%
 R904 27K - 1 watt
 R905 100K
 R906 1K S-Meter Zero Pot.
 R907 1K
 R1001 10K
 R1002 47K
 R1003 270 ohms
 R1004 270K
 R1005 1 Meg
 R1006 10 Meg
 R1007 47K
 R1008 100K
 R1101 6.8K
 R1102 100K
 R1103 4.7K
 R1104 100K
 R1105 2.2 Meg
 R1106 2.2 Meg
 R1107 270K
 R1201 1 Meg AF Gain Pot.
 R1202 47 ohms
 R1203 1 Meg
 R1204 270K
 R1205 330K
 R1206 330K
 R1207 33K
 R1208 680K
 R1209 1K
 R1210 27 ohms
 R1301 1K
 R1302 10K
 R1303 10K Quad. Bal. Pot.

R1304 18K - 2W
 R1305 100K
 R1306 27K
 R1307 5K Car. Bal. Pot.
 R1308 1K
 R1309 100K
 R1310 27K
 R1311 27K
 R1401 1K
 R1402 1 Meg Mic. Gain Pot.
 R1403 150K
 R1404 270K
 R1405 2.2 Meg
 R1406 47K
 R1501 18K
 R1502 1.5K - 5%
 R1503 2.2K
 R1504 100 ohms
 R1601 1K
 R1602 10K
 R1603 100K
 R1604 100K
 R1605 10K
 R1606 27K
 R1607 68K
 R1608 47K
 R1609 10K 25KC Adjust Pot.
 R1610 470 ohms
 R1611 3.9K
 R1612 5.6K
 R1613 3.9K
 R1701 1K - 5%
 R1702 1K - 5%
 R1703 1K - 5%
 R1704 470 ohms - 5%
 R1705 2.7K
 R1706 2.7K
 R1707 470 ohms - 5%
 R1801 900 ohms - 10 watt
 R1802 500 ohms - 10 watt
 R1803 470 ohms
 R1804 750 ohms - 10 watt
 R1805 27K
 R1806 27K
 R1807 470K - 1 watt
 R1808 27K
 R1809 10K RF Gain Pot.
 R1810 270K
 R1811 10K
 R1812 470K
 R1813 270K
 R1814 470 ohms
 R1815 1 Meg
 R1816 470K

COILS

L101 10 mtr VFO Amp. Coil
 L102 15 mtr VFO Amp. Coil
 L103 40 mtr VFO Amp. Coil
 L104 20-80 mtr VFO Amp. Coil

L105 10 mtr Rec. Coil
 L201 RFC - 200 uh
 L202 15 mtr Mixer Coil
 L203 10 mtr Mixer Coil
 L204 40 mtr Mixer Coil
 L205 20 mtr Mixer Coil
 L206 80 mtr Mixer Coil
 L301 10 mtr Driver Coil
 L302 15 mtr Driver Coil
 L303 20 mtr Driver Coil
 L304 40 mtr Driver Coil
 L305 80 mtr Driver Coil
 L306 RFC - 200 uh
 L401 RFC - 100 uh
 L402 RFC - 55 uh
 L403 Final Tanl Coil
 L404 RFC - 30 uh
 L601 12 MC Trap Coil
 L801 1st IF Amp. Coil
 L901 2nd IF Amp. Coil
 L1501 RFC - 200 uh
 L1701 RFC - 200 uh
 L1702 RFC - 200 uh
 L1703 10 mtr VFO Coil
 L1704 15 mtr VFO Coil
 L1705 20 mtr VFO Coil
 L1706 40 mtr VFO Coil
 L1707 80 mtr VFO Coil
 L1801 RFC - .82 uh
 L1802 RFC - .82 uh
 L1803 RFC - .82 uh
 L1804 RFC - 200 uh
 Z301 Parasitic Suppressor
 Z401 Parasitic Suppressor
 Z402 Parasitic Suppressor

TRANSFORMERS

T1301 Bal. Mod.
 T1201 AF Output

SWITCHES

S1A-G Bandswitch
 S2 PTT - VOX
 S3 ANL
 S4 PA Coarse Load
 S5 Power ON - OFF
 S6 100KC - 25KC Cal.
 S7 CAL-REC-TRANS-
 CW-TUNE
 S8 Sideband Selector

RELAYS

K1 4PDT, 12 VDC Coil
 K2 3PDT, 12 VDC Coil

CRYSTALS

Y1501 5503.3KC Car. Osc.
Y1502 5500.0KC Car. Osc.
Y1601 100KC Crystal Cal.

DIODES

D401 1N34A
D701 1N914
D1101 1N34A
D1102 1N34A
D1201 RCA 39804 (1N3195)
D1202 RCA 39804 (1N3195)
D1801 1N2974A Zener
D1802 RCA 39804 (1N3195)
D1803 1N914
D1804 1N914
D1805 1N914

TUBES

V1 6EW6 VFO Amp.
V2 12BE6 Trans. Mixer
V3 6GK6 Driver
V4 6LQ6 Power Amp.
V5 6LQ6 Power Amp.
V6 ~~6BZ6~~ ~~12B76~~ Rec. RF Amp.
V7 12BE6 Rec. Mixer
V8 1st IF Amp.
V9 2nd IF Amp.
V10 12AX7 Prod. Det./Rec. AF
V11 6BN8 AGC/ALC Amp.
V12 6GK6 AF Output
V13 6JH8 Bal. Mod.
V14 12AX7 Trans. AF Amp./Mic. Amp.

TRANSISTORS

Q1 2N706
Q2 2N706
Q3 2N706
Q4 MPS 3693
Q5 MPS 3693
Q6 MPS 3693
Q7 MPS 3693

LIGHTS

B1 GE 47, 6V
B2 GE 47, 6V

Resistors are ½ watt unless specified. K equals 1000 ohms.

TROUBLESHOOTING GUIDE		
DEFECT	POSSIBLE CAUSE	
PA IDLING CURRENT UNSTABLE	1. Defective 6LQ6 2. Defective Bias Potentiometer 3. Defective Bias Supply	
INABILITY TO LOAD TO 400-500 MA. (SEE PAGE 10)	1. PA Grid Improperly Tuned 2. Bandswitch Improperly Set 3. Antenna Not Resonant at Frequency 4. Defective Transmission Line 5. Defective Mobile Antenna Coil 6. V2, V3, V4, V5 Defective 7. R409 or R408 Defective	
INSUFFICIENT CARRIER SUPPRESSION	1. Carrier Balance Control Improperly Adjusted 2. Defective 6JH8 Balanced Modulator 3. Carrier Oscillator Frequency Incorrect	
INSUFFICIENT SIDEBAND SUPPRESSION	1. Excessive MIC. Gain 2. Incorrect PA Load Adjustment 3. Carrier Oscillator Frequency Incorrect	
MICROPHONICS IN RECEIVER	1. L901 Improperly Tuned 2. V14, V10, V8, V7, or V6 Defective	
LOW RECEIVER SENSITIVITY	1. PA Grid, Plate, or Load Improperly Set 2. Bandswitch Improperly Set 3. K2 Back Contacts Defective 4. V6, V7, V8, V9, V10, V11, V12 Defective	

VOLTAGE CHART													
TUBE TYPE	PIN NO.												
	1	2	3	4	5	6	7	8	9				
V1-6EW6	R 0	75	6.3 AC	0	140	130	0						
	T -100	75	6.3 AC	0	125	125	0						
V2-12BE6	R -28	0	12.6 AC	0	240	215							
	T 0	0	12.6	0	245	100							
V3-6GK6	R 0	-34	0	6.3 AC	0	0	270	270					
	T 0	-6	0	6.3	0	0	270	250					
V4-6LQ6	R 0	-95	--	6.3 AC	0	-95	0	0	0				
	T 0	-95	--	6.3	0	-95	250	0	0				
V5-6LQ6	R 250	-95	--	6.3 A.C.	12.6 A.C.	95							
	T .5	-95	--	6.3	12.6	95							
V6-6BZ6	R .5	.8	0	12.6 A.C.	270	150	0						
	T -31	0	0	12.6	270	-20	0						
V7-12BE6	R -26	0	12.6 A.C.	0	250	55	1						
	T .5	0	12.6	0	250	-20	.3						
V8-12BA6	R .7	0	12.6 A.C.	0	230	130	0						
	T -.05	0	12.6	0	250	150	0						
V9-12BA6	R -.5	0	12.6 A.C.	0	240	125	1.9						
	T 115	0	12.6	0	255	-15	0						
V10-12AX7	R 45	.7	1	12.6 A.C.	0	175	0	1.5	0				
	T .5	.7	-.5	12.6	0	245	-90	0	0				
V11-6BN8	R 1.6	2.6	.5	6.3 A.C.	12.6 A.C.	1.2	260	0	.5				
	T 0	2.6	1.6	6.3	12.6	0	200	0	1.6				
V12-6GK6	R 0	-- 8	--	12.6 A.C.	6.3 A.C.	--	270	250	0				
	T 12	-- 8	--	12.6	6.3	--	260	250	0				
V13-6JH8	R 12	11	0	6.3	0	-100	0	270	250				
	T 70	11	64	6.3	0	0	0	260	250				
V14-12AX7	R 75	0	0	6.3 A.C.	6.3 A.C.	114	0	7	0				
	T 50	0	0	6.3	6.3	100	0	4	0				
Voltage Checks Made With 20,000 Ohms Per Volt VTVM													

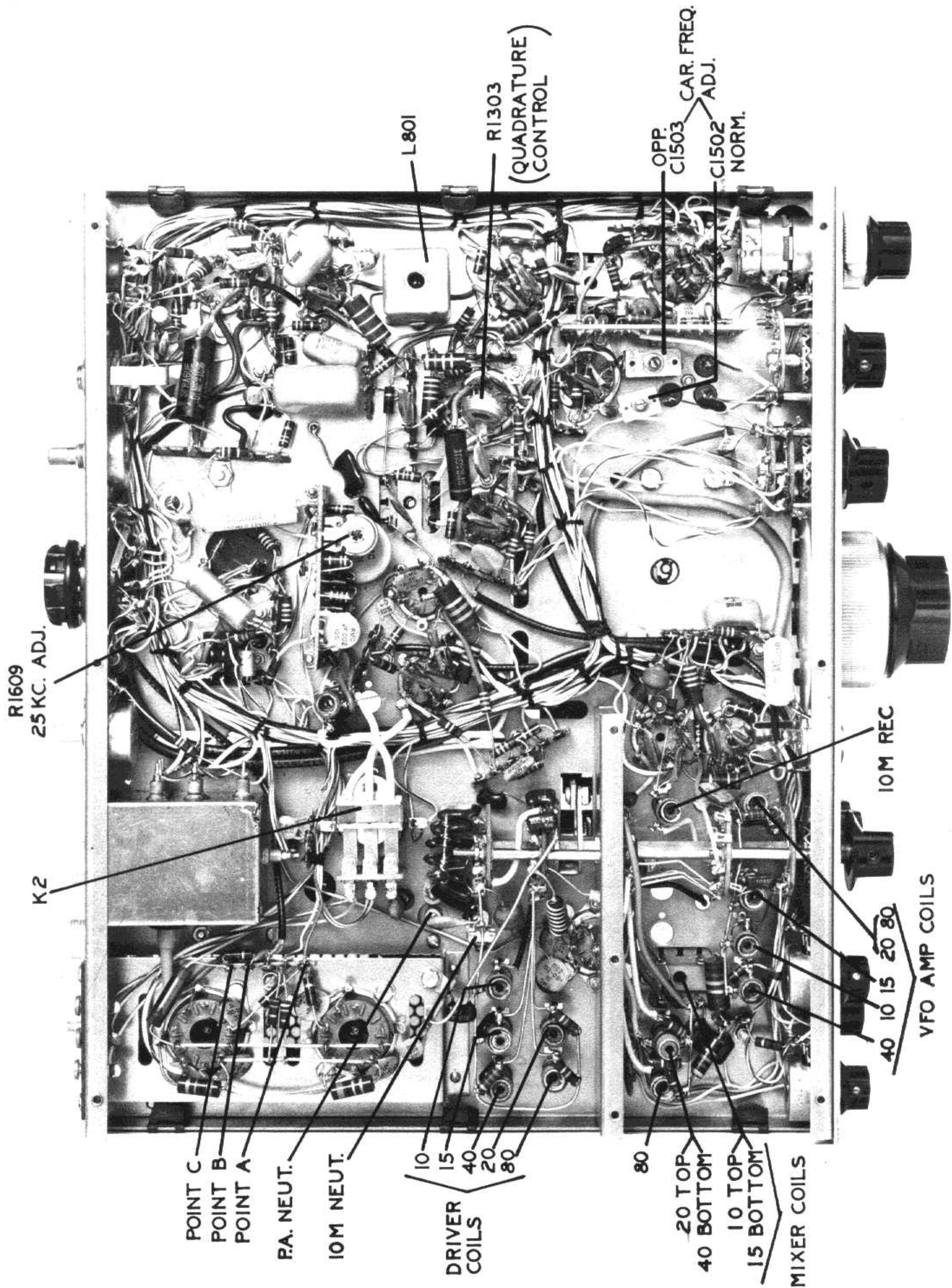


FIG. 5 BOTTOM VIEW MODEL 500CX

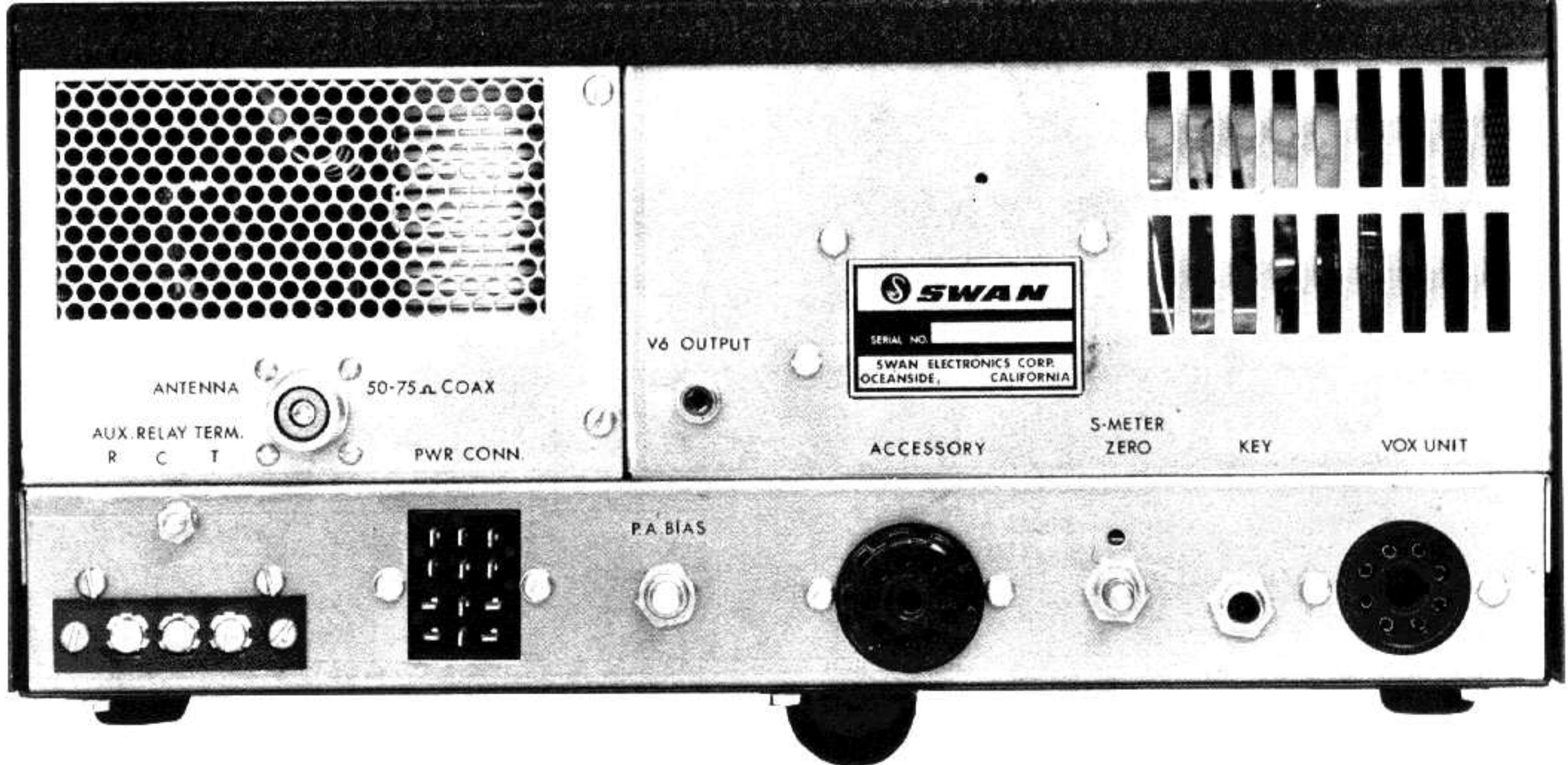


FIG. 6 REAR VIEW MODEL 500CX

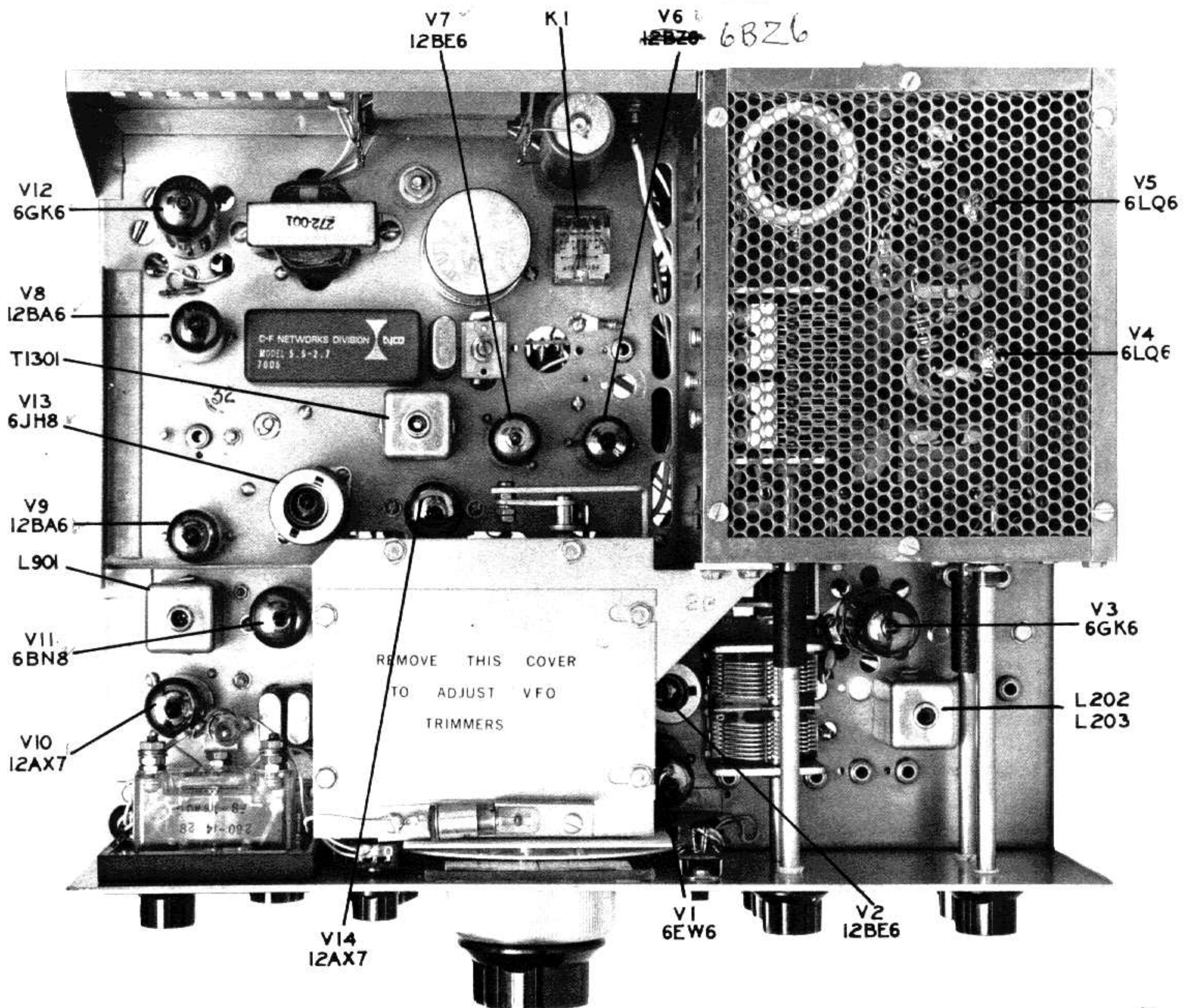
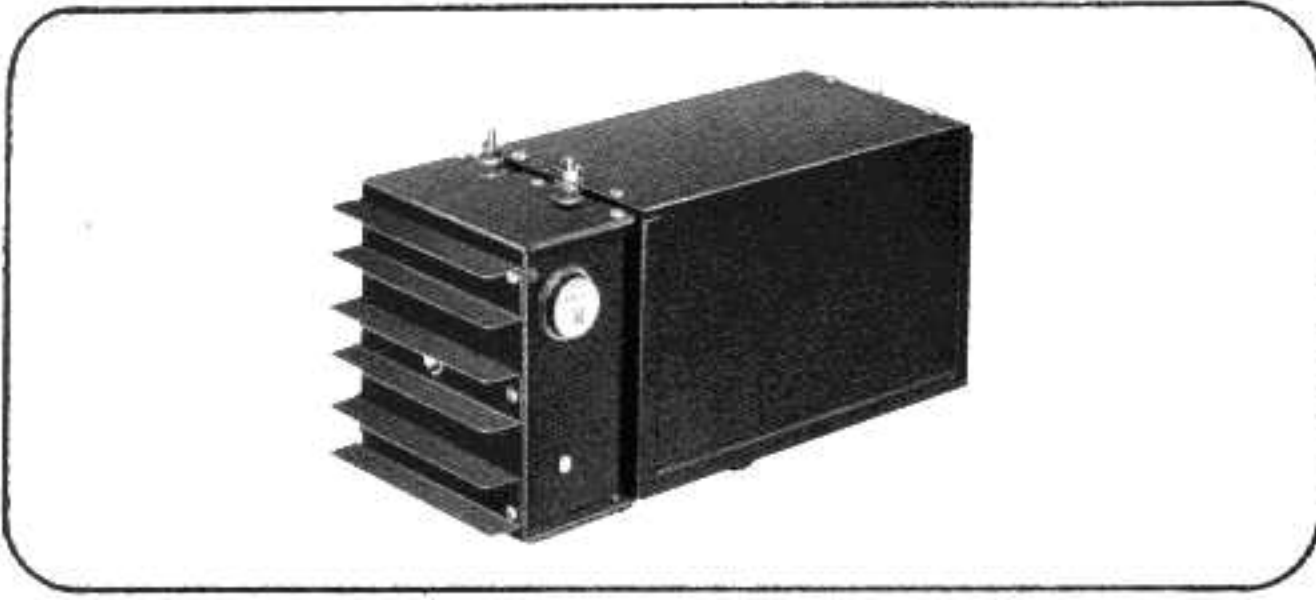


FIG. 7 TOP VIEW MODEL 500CX

500-CX POWER SUPPLIES AND COMBINATIONS

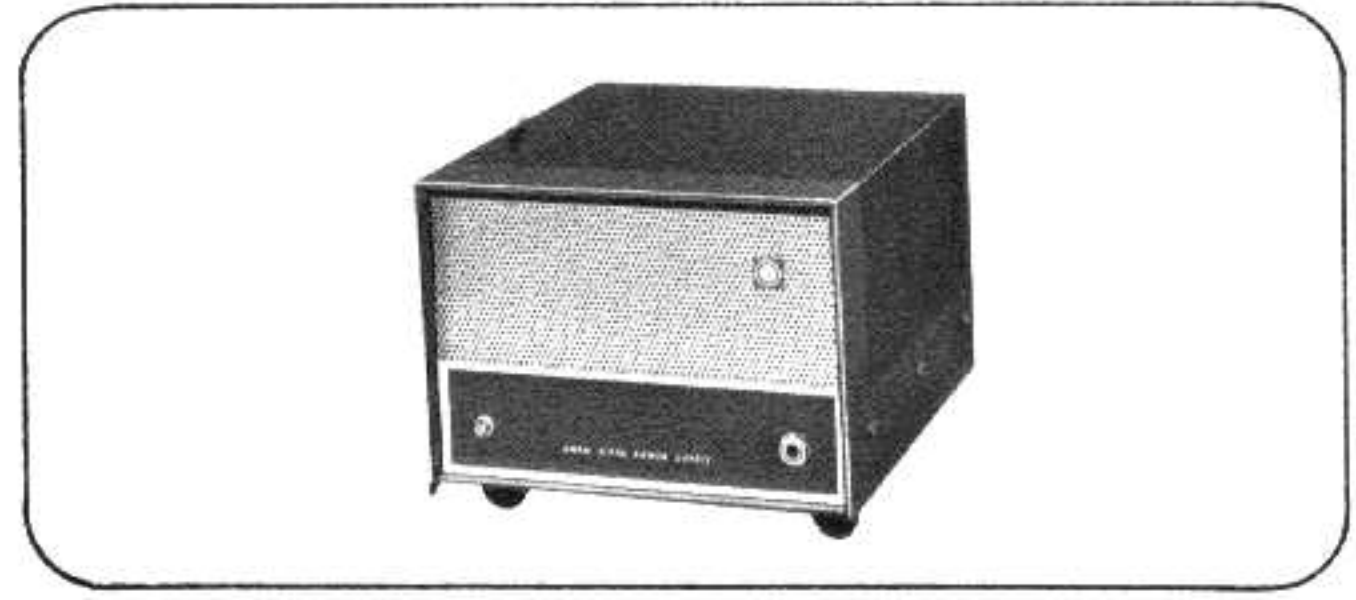


COMPLETE 12 VOLT D.C. SUPPLY MODEL 14-117

Consists of a 117-X A.C. supply and a 14-C D.C. Converter. For 12-13.5 volt mobile or portable operation. Includes 8 ft. cable and plug pre-wired for connection to transceiver, primary cables, circuit breaker, and mounting hardware. 5 in. wide, 5 in. high, 12 1/4 in. long. Weight: 16 1/2 lbs.

MODEL 14-230. Same as above but with 230-X A.C. unit.

Model 14-117 and 14-230 D.C. supplies will operate on A.C. input by detaching the 14-C unit and attaching an A.C. line cord, thus providing added versatility.

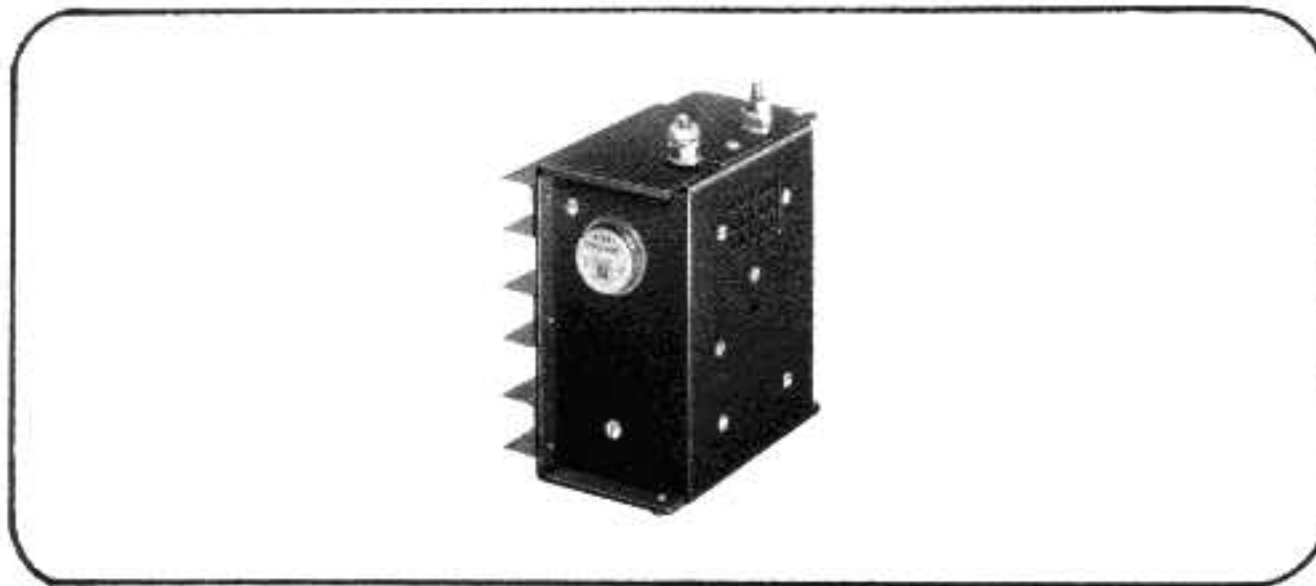


COMPLETE MATCHING A.C. SUPPLY MODEL 117-XC

Consists of a 117-X power supply in a cabinet which matches Swan transceiver. Includes speaker, phone jack, and indicator light. Comes with A.C. line cord, and power cable ready to plug into transceiver. 8 in. wide, 5 1/4 in. high, 11 in. deep. Weight: 21 lbs.

MODEL 230-XC. Same as above but with 230-X supply for dual 117 or 230 volt A.C. input. Comes with 230 volt line cord, unless otherwise specified.

Model 117-XC and 230-XC A.C. supplies will operate on 12-13.5 volts D.C. input by attaching a 14-C Converter Unit in place of the A.C. line cord, thus providing added versatility for portable or emergency operation from a 12 volt battery.



D.C. CONVERTER MODULE MODEL 14-C

Transistorized Unit attaches to 117-X or 230-X power supply, converting them to 12-13.5 volt D.C. input for mobile or portable operation. For negative ground systems. Includes cables, plugs, circuit breaker, and mounting hardware. Average current drain: 9 amps. receive. 22 amps. transmit. Dimensions: 5 x 5 x 3 1/2 in. Weight: 2 1/2 lbs.

MODEL 14-CP. Same as above but for positive ground system. Available on special order.



BASIC A.C. POWER SUPPLY MODEL 117-X

Operates with 117 volts, 50-60 cycle input. Supplies all voltages required to operate Swan transceiver. Does not include matching cabinet, speaker or cables. Average power consumption: 125 watts, receive; 325 watts, transmit. Dimensions: 5 x 5 x 8 3/4 in. Weight: 14 lbs.

MODEL 230-X. Same as above but with dual primary winding for either 117 or 230 volt 50-60 cycle input.

GENERAL DESCRIPTION

The Swan Power Supply systems are designed to provide all necessary voltages required by Swan Transceiver models 240, 250, 350, 350-C, 500 and 500-C. This also includes the 300 series and 400 series commercial models. The model 117-X basic A.C. supply is designed for an input of 117 volts at 50 or 60 cycles. The model 230-X is identical except that it operates with 230 volts AC input. By simply changing line cords, it will also operate on 117 volts A.C.

For fixed station use, the 117-X 230-X is installed in a cabinet which matches the Swan transceivers. This cabinet also contains a speaker, phone jack, and indicator light. The complete combination is designated as model 117-XC or 230-XC. The A.C. line cord plugs into the back of the supply. In the 230-XC, choice of 117 or 230 volts input is made by selecting line cords.

12 VOLT D.C. OPERATION

A D.C. Converter attaches to the back of the A.C. supply, and converts it for 12-13.5 volts D.C. input. The model 14-C D.C. Converter is for negative ground systems, the most common type. (For positive ground systems, the model 14-CP D.C. converter is available on special order.) Combination of an A.C. supply with a 14-C Converter is designated as model 14-117 or 14-230 depending on which A.C. supply is used. The positive ground models are designated as model 14P-117 or 14P-230.

With the versatility of this power supply design, a number of advantages become apparent. The 14-117 mobile supply may be operated from a 117 volt A.C. line by detaching the D.C. Converter and plugging in an A.C. line cord.

The matching A.C. supply, model 117-XC or 230-XC, may be converted easily to 12-13.5 volts input by attaching the 14-C D.C. converter to the back. This provides for portable or emergency operation from a 12 volt battery. There may also be times when it will be desirable to operate temporarily in an automobile, such as during a vacation trip, field day, or emergencies. The 117-XC can be set on the floor or front seat, and with the 14-C attached it becomes a 12-volt power supply, complete with speaker.

The D.C. Converter uses two power transistors for switching in a flip-flop oscillator circuit. A large portion of the cost in this unit is in the transistors where no compromise has been made. They are rated at 60 amperes, with a 45 volt rating.

SPECIFICATIONS

Power Rating: 250 watts average, 600 watts peak.

Input:

Model 117-X: 117 volts nominal, 50-60 cycles.

Model 230-X: 230 volts or 117 volts, 50-60 cycles.

Model 14-C: 13.5 volts D.C. nominal, 40 amps. peak.

Output:

800 volts at 240 ma. average, 700 ma. peak.

275 volts at 150 ma. continuous.

110 volts negative bias, at 100 ma.

12 volts D.C. at 200 ma., relay supply.

12.6 volts A.C. at 5.5 amps. (with A.C. input only)

Battery Drain with Swan Transceiver:

Rec: 3.5 amps. Trans: 16 amps. average, 40 amps. peak, plus 5.5 amps. for vacuum tube heaters.

MATCHING CABINET

Ordinarily the A.C. supply will be purchased complete in a matching cabinet as either model 117-XC or 230-XC. However, in some cases an owner may have purchased a 117-X or 230-X basic supply only, perhaps in a D.C. supply combination, and he may wish later on to mount it in a matching cabinet. For this purpose the cabinet with speaker and cables is available separately. The basic A.C. supply mounts inside with three screws, and the pre-wired cable connects as shown in the schematic. Connections to the phone jack and speaker have already been made. Two leads from the indicator light must be run through grommet and soldered to the terminals provided at the bottom of the supply. Refer to the schematic for clarification. The A.C. line cord is also provided with the matching cabinet kit. These line cords are available separately also, and come normally wired and stamped for 117 volts. 230 volt line cords are also available on special order, or the 117 volt line cord may easily be wired for 230 volts by referring to the schematic. Note that the 230 volt line cord will work only with the 230-X basic A.C. supply. The 117 volt line cord will work with either the 117-X or 230-X.

ELECTRICAL DESIGN

Both the A.C. and D.C. sections are conservatively designed for long, reliable service with a minimum failure rate. At the same time, they are designed for easy access and servicing for those times when it is required. Any component can be readily checked out and replaced in a matter of moments. The D.C. Converter and A.C. supply can be detached quickly from one another and tested individually, thus isolating the source of trouble.

The A.C. supply is quite conventional, using a silicon rectifier bridge for the medium voltage, and another for high voltage. The 117-X has a single primary winding for 117 volt input, while the 230-X has a pair of primary windings which connect in parallel for 117 volts, and in series for 230 volts. The switching is taken care of in the A.C. line cord plug.

MOBILE INSTALLATION

Model 14-117 or 14-230.

12-13.5 volts D.C., Negative ground only. (For positive ground systems, the D.C. converter unit must be a model 14-CP, available from your dealer on special order.)

FIG. 8 SWAN MODEL 14-C D.C. CONVERTER

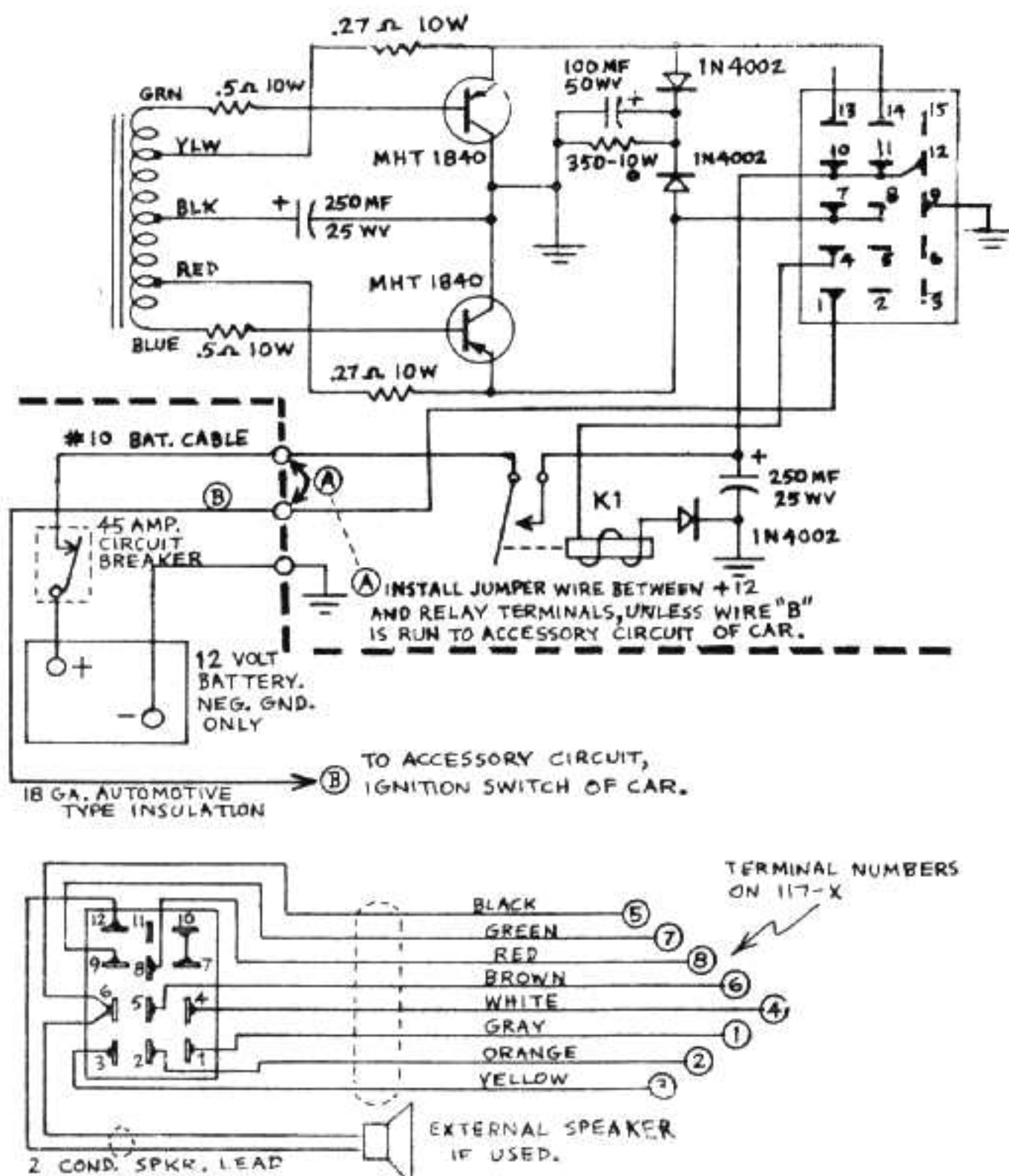
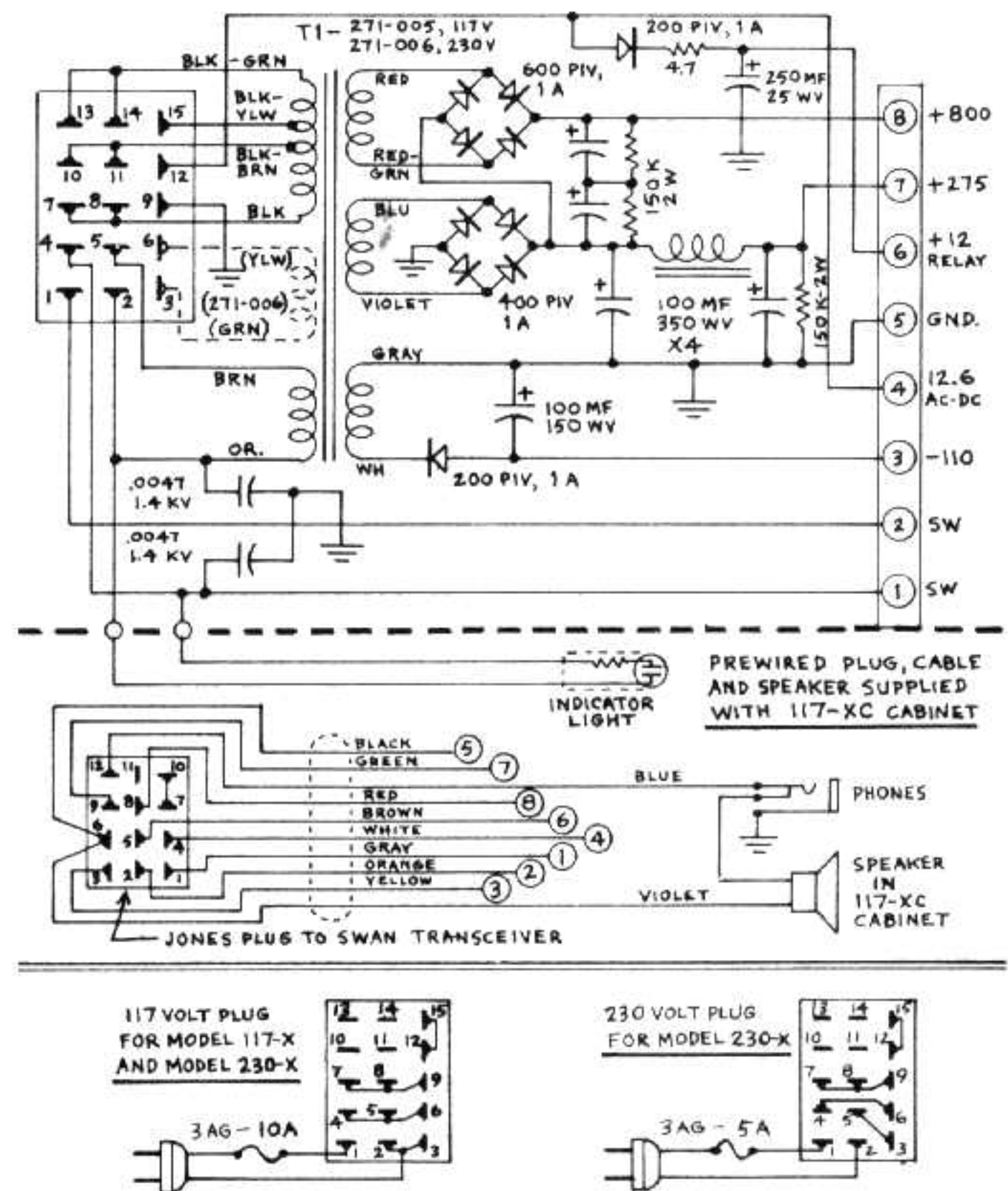


FIG. 9 SWAN MODEL 117-X (230-X) A.C. POWER SUPPLY



1. Preliminary Steps. The D.C. electrical system in an automobile will sometimes generate high voltage transients. This can be caused by the starter motor, the alternator or generator, or loose wiring, and can represent a serious hazard to the transistors in your DC power supply. By selecting the best transistors available for the application, your Swan supply is capable of absorbing a good deal of abuse, but there is a limit to what even the best transistors can take and for this reason we strongly urge that you read the following notes completely, and follow them carefully. When this is done, you will find that your Swan power supply is extremely rugged and reliable. Field problems with the 14-117 supply are exceptionally low. But, first observe the following steps.

- Clean and tighten the battery terminals and clamps.
- Tighten battery cables where they attach to the starter solenoid and engine block.
- Inspect battery cables for corrosion or wear. Replace them if they look questionable.
- Check battery condition frequently. If the cells do not hold a similar charge or water level, replace the battery.
- Check alternator, (or generator), and regulator connections for tightness. Also, primary ignition wiring, horn wiring, lights, etc.

f. Measure the charging voltage from the alternator. Often the regulator is misadjusted, and the voltage setting may be excessive. It should not read more than 14.5 volts at normal engine speeds.

2. Locate the power supply under the hood in a reasonably clear spot as close to the battery as is practical, and away from the engine. Particularly, keep it clear of the engine manifold, and away from the high tension ignition wiring. On many cars there will be a good spot at the front and to one side of the radiator. The power supply may mount in any position, and is quite well protected against normal splashing and dirt. The 117-X unit attaches to the car with three sheet metal screws. Remove the 117-X cover, and locate the three mounting holes. The 14-C Converter attaches to the 117-X with the long machine screw. In some cars it may be impossible to find room enough under the hood for the 14-117 assembly. If necessary, the 14-C and 117-X units can be separated 2 or 3 feet, and connected electrically with appropriate Jones plugs. 10 gauge wire is then required between terminals.

In other cases, it may be advantageous to install the 14-117 under the dash, or in the trunk of the car. Heavy battery leads with adequate automotive type insulation must be used. For trunk mounting, at least 6 gauge cables are recommended. In all installations the circuit breaker must be mounted close to the battery. Never run a long cable from the hot battery terminal to the power supply without a fuse or circuit breaker close to the battery. Failure to observe this rule will result in a serious fire hazard!

MOBILE INSTALLATION (cont.)

3. Connect a cable from the hot battery terminal to the circuit breaker, keeping this cable as short and direct as possible. Then connect a cable from the circuit breaker to the -12 post on the 14-C converter unit. Next, connect a cable from the negative post of the 14-C unit to the ground terminal of the battery. If possible, drill and tap a hole in the battery post for a contact stud. The more directly the cables are connected to the battery, the less chance there will be for voltage transients to reach the transistors.

4. Run the 10 conductor power cable from the transceiver to the power supply and connect by color code as illustrated in the schematic diagram.

5. There are two ways of wiring the relay circuit in the 14-C converter. The simplest method is to connect a wire jumper from the relay terminal post to the +12 terminal on the 14-C. These posts are just an inch apart, and an 18 gauge bare jumper is sufficient. However, when connected this way, it will be possible for anyone to turn on the transceiver at any time, and for the transceiver to be accidentally left on, running down the battery.

The second wiring method provides for connection to the accessory circuits of the car, so that the ignition key is required in order to turn on the transceiver. To do this an 18 gauge insulated wire must be run from the 14-C relay terminal to the accessory circuit under the dash of the car. This wire may be run alongside the 10 conductor power cable which goes to the transceiver. The accessory circuit will be found on one terminal of the ignition switch. Your service garage can be helpful in locating this. Otherwise, it may be easier to locate the 12 volt input line to the car radio, and splice into this line. Since the 14-C relay draws very little current, tapping into the car radio line will not matter, regardless of which side the car radio fuse is on.

6. Speaker Connections. The two conductor lead coming from the Jones plug goes to an external speaker with 3 to 4 ohm voice coil. This speaker may be one already installed in the dash of the car or under the dash, and a selector switch may be installed to switch the speaker over from the car radio to the transceiver. An easier arrangement, however, is to install a 3 x 5 in. speaker inside the transceiver. The 500-CX provides a mounting place on the left side, with terminal lugs on top of the chassis for connection to the speaker. One side of the speaker voice coil connects to the insulated terminal, and the other side connects to the ground terminal.

VOLTAGE REGULATION, MOBILE OPERATION

In D.C. to D.C. converters designed for mobile operation of Transceivers, it is important to note that output voltages will be related directly to the D.C. input voltage. The Swan model 14-117 supply is designed so that when input voltage is 13.5 volts, output voltages will be at nominal ratings, the same as with 117 volts A.C. input.

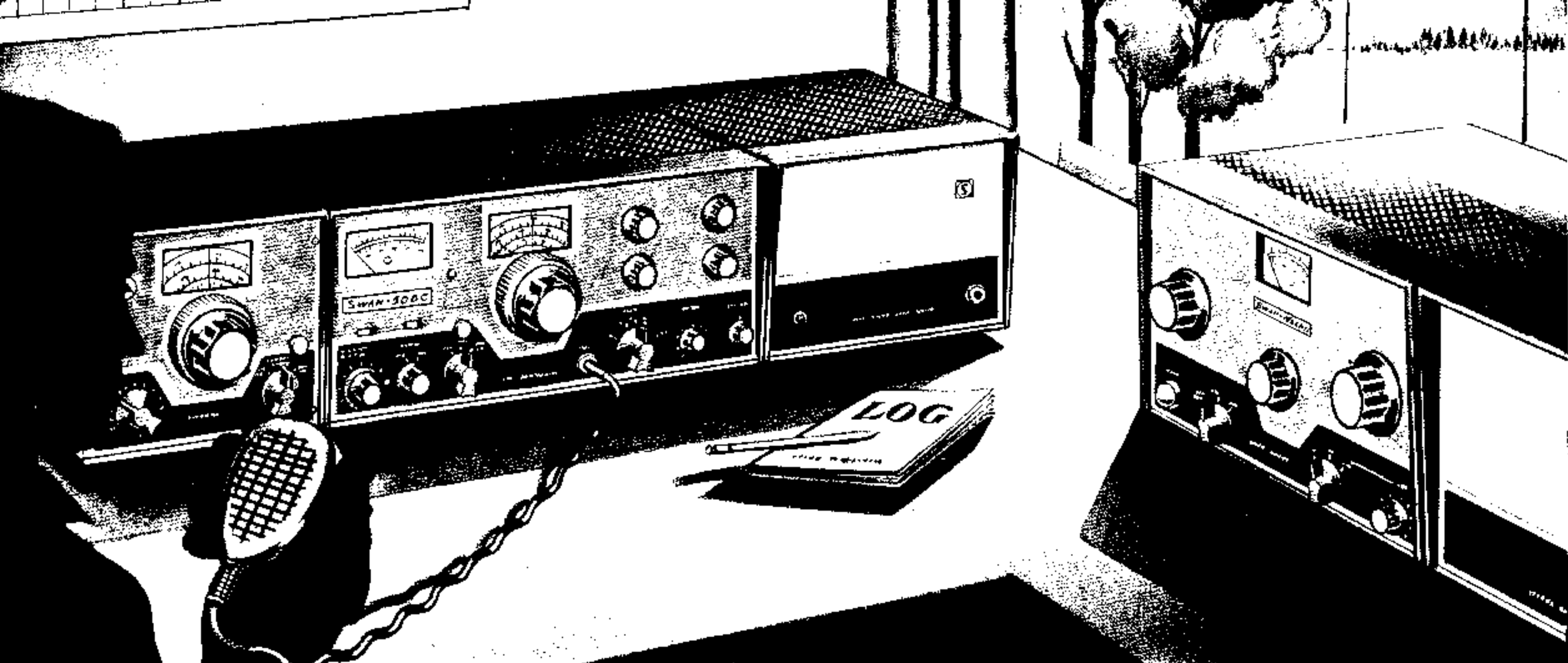
Therefore, when Transceiver Tuning is performed without the engine running, it must be recognized that operating voltages will be considerably lower than normal, and meter readings will be less than with the engine running. In some cases, input voltage without the engine running may be as low as 11.5 volts, resulting in still lower meter readings. If the D.C. supply were designed to deliver normal output voltages at 11.5 or 12 volts input, then they would be dangerously high with the engine running.

The wire size and length of run from the battery to the 14-C converter is also an important factor governing output voltage from the power supply. The voltage drop across these leads should be kept reasonably small. 10 gauge wire is supplied with the 14-C converter, and is heavy enough for average runs of 3 to 4 feet. For longer runs it would be advisable to use 8 gauge, while for trunk mounted power supplies 6 gauge or even 4 gauge is recommended. It should be noted, however, that the really important factor in determining wire size is how much input voltage is delivered to the 14-C module during average voice modulation, when some 16 to 18 amperes are being drawn through the wire. In TUNE position considerably more current is drawn, as much as 35 to 40 amperes, and the voltage drop may be quite high. However, this is not a particular handicap; in fact, drop, since the electrolytic capacitors in the power supply there is a definite safety factor in having a rather poorly regulated input which drops when you switch to TUNE. There is no reason to be unduly concerned about this drop, since the electrolytic capacitors in the power supply have ample storage capacity to provide good dynamic regulation during voice modulation.

To summarize: the best way of determining if the battery leads are large enough is to measure input voltage at the 14-C terminals while voice modulating. If the voltage drops less than ½ volt when speaking normally into the microphone, the leads are heavy enough. If the drop is more than ½ volt, the leads should be larger. Finally, do not expect full operating power unless the engine is running, and the generator is charging properly.

POWER SUPPLY WARRANTY POLICY

The normal guarantee on your Swan power supply is for a period of 90 days from date of purchase, and covers all components, material and workmanship. In the case of transistor failure, however, the warranty on them will be void if inspection proves that high transient voltages from the automobile were responsible. We will do all in our power to be fair and just in this determination. The warranty card must be filled out and mailed to the factory within 10 days from date of purchase. Do not ship a unit to the factory for servicing without prior authorization. Check with your dealer first, as he may be in a position to handle the service work more quickly. This warranty is void if the equipment has been misused or damaged.



ACCESSORIES

PHONE PATCH, MODEL FP-1:

The Model FP-1 Phone Patch is designed to connect a radio receiver and transmitter, or transceiver to a telephone so that the party on the other end of the telephone line can listen and talk over the radio circuit. The Unit is designed specifically to connect easily and quickly to any of the Swan Transceivers, although it can also be used with other transceivers, or with separate receivers and transmitters.

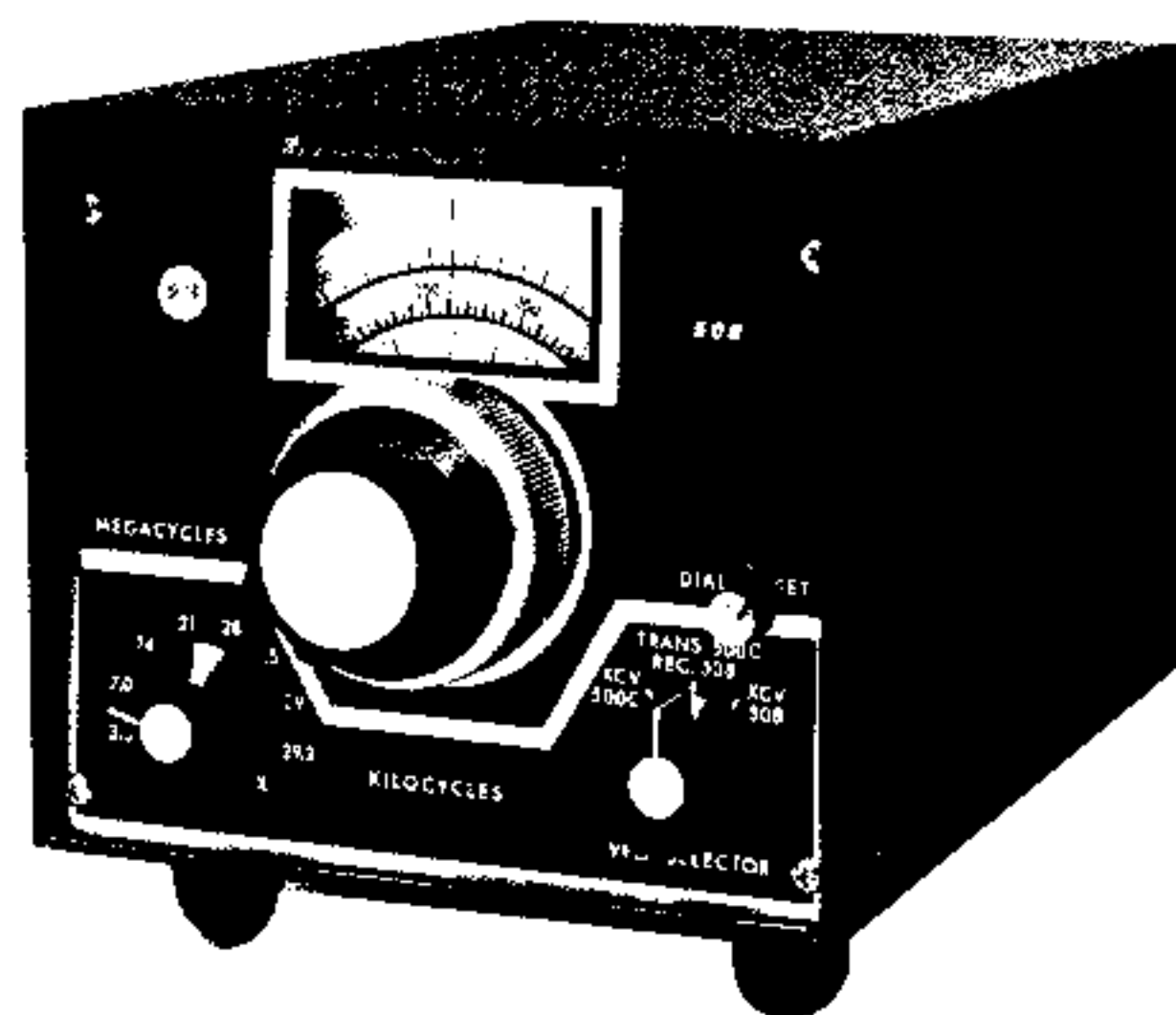
8. Panel Controls: (a.) ON-OFF Switch, (b) Receiver Gain, controls volume level of signal going from the radio into the telephone. (c) Transmitter Gain, controls volume level of signal going from the telephone into the transmitter.
9. Rear Control: "NULL" adjustment. Important only during VOX operation. Keeps the received radio signal from tripping the VOX. Factory set, should not require adjustment.
10. Dimensions: 6 in. wide, 2 1/2 in. high, 4 1/2 in. deep.

SPECIFICATIONS:

1. "Line" Input Impedance 600 ohms
2. Speaker Impedance 3-4 ohms
3. Receiver Output Impedance 3-4 ohms
4. Microphone (Low Level Output) High Impedance
5. Phone Patch Output to Transmitter High Impedance
6. Mic. Jack: 3 circuit, Phone Jack Type, 1/4 inch diam.
7. Mic. Plug: 3 circuit, Phone Jack Type, 1/4 inch diam., matches all Swan Transceivers. Includes Press-To-Talk Circuit.

The FP-1 is a hybrid telephone design, which means that it may be used with VOX, (automatic voice controlled transmit) as well as with manual transmit control. Connections with the Transceiver and telephone have been organized so that once it is installed there is no need to plug or unplug the microphone or cables when using or not using the Phone Patch. The regular station microphone plugs into the back of the Phone Patch, while the shielded cable with plug coming from the phone patch plugs into the Mic. Jack of the Transceiver. When the Phone Patch is turned "OFF", the microphone is connected to the Transceiver for normal operation. When the Phone Patch is turned "ON", the telephone becomes the microphone. However, the press-to-talk switch on the station mike is still operative, and so is still used to switch from receive to transmit, unless VOX is being used.

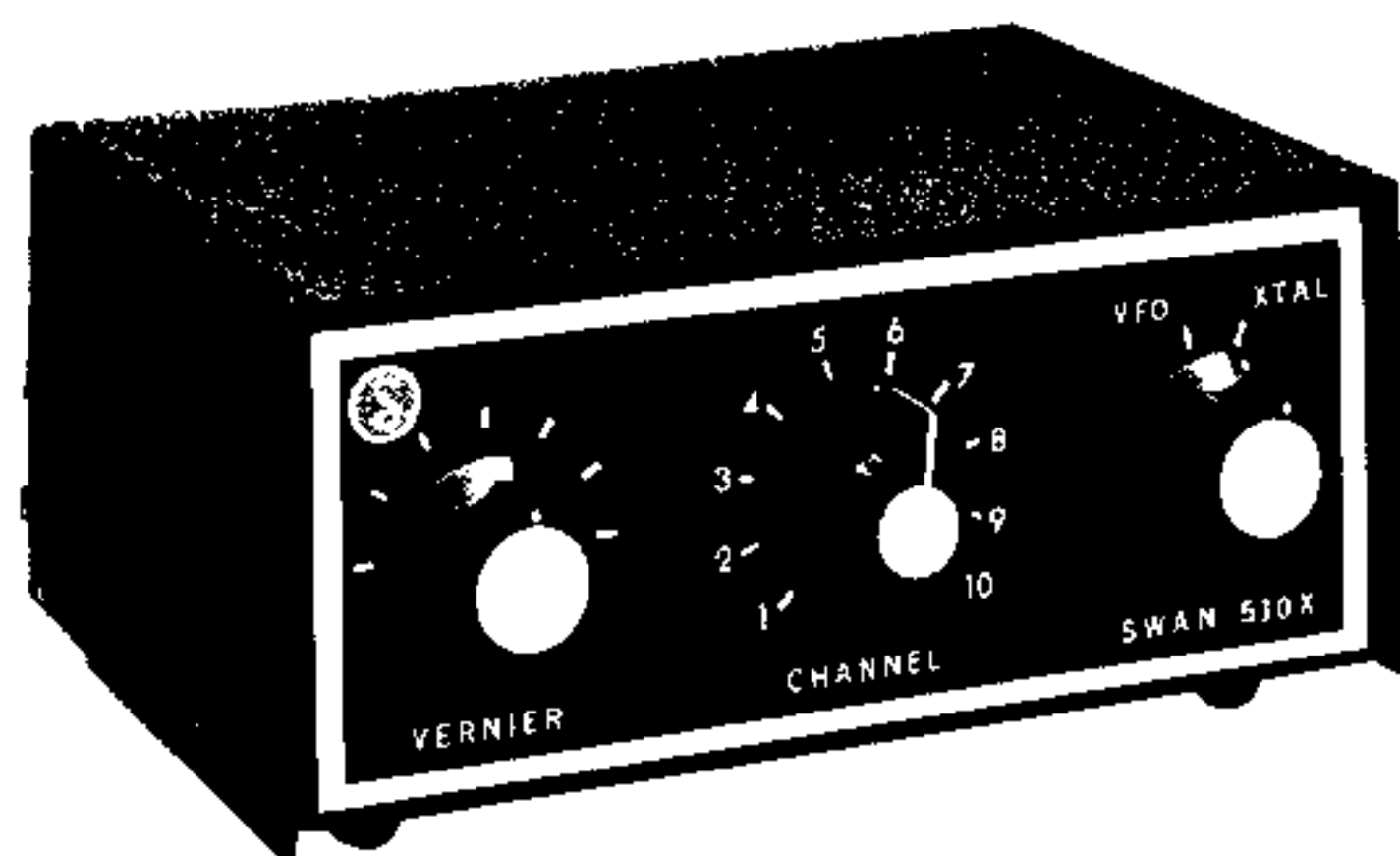
MODEL 508 EXTERNAL VFO



The Swan Model 508 Frequency Control Unit is designed to serve as an external VFO to be used with the Swan 500CX transceiver. The 508 plugs directly into the back of the transceiver after the jumper plug has been removed. The position of the VFO selector switch on the front panel of the Model 508 will determine split-frequency operation, or transceiver operation on the 500CX.

The dial of the Model 508 is calibrated in 5 KC

increments on each range. The 80 meter band is calibrated for direct readout on the dial. Calibration for all other ranges is on a 0-500 KC scale and the reading of this scale would be additive to the megacycle range as selected by the VFO bandswitch. A smaller vernier dial is included and is calibrated in 1 KC increments. An extra position is included on the bandswitch for possible installation of an additional tuning range. WWV reception at 15 mc is also included.



MODEL 510X CRYSTAL OSCILLATOR

The Model 510X oscillator unit provides for added versatility with the Swan 500CX by crystal controlling the operating frequency. Not only does this permit fixed frequency "net" operation in the 80, 40, 20 and 15 meter amateur bands, but the 510X also permits operation outside the amateur bands for MARS, commercial and other services. Vernier frequency adjustment is provided by a panel control, and a selector switch provides for choice of either crystal control of 500CX internal VFO.

A ten position switch allows selection of up to ten crystal frequencies. The Model 500CX will operate within the following ranges without modification:

- 3.5 mc Range: 3.2 to 4.6 mc
- 7 mc Range: 6.5 to 8.2 mc
- 14 mc Range: 13.8 to 15.0 mc
- 21 mc Range: 20.9 to 21.5 mc

NOTE: The 510X will not operate on the 28 mc Range.

PLUG IN VOX AND BREAK-IN CW ACCESSORY, MODEL VX-2

OPERATING INSTRUCTIONS

1. Place the VOX-PTT switch in the PTT position and adjust the transceiver for normal push-to-talk operation.
2. Plug in the VX-2 and rotate the VOX GAIN, ANTI-VOX, and DELAY controls fully counter-clockwise. Attach the top of the VX-2 to the 500C back with a 6-32 screw.
3. Rotate the transceiver MIC. GAIN fully counter-clockwise. This will prevent audio from being transmitted but will not affect VX-2 during initial adjustments.
4. Place the VOX-PTT switch in the VOX position.
5. While speaking into the microphone in a normal manner, slowly rotate the VOX GAIN control clockwise until the VX-2 keys the transmitter. Do not use more VOX GAIN than necessary to assure positive operation at normal voice levels.

6. Increase the receiver gain until receive signals are at a normal volume level. These signals will trip the VOX when picked up by the microphone.

7. With the microphone held in the normal operating position, very slowly increase the ANTI-VOX until received signals do not trip the VOX.

NOTE: Excessive ANTI-VOX gain will cause received signals to gate the VX-2 off so that no amount of sound at the microphone will key the transmitter. Satisfactory balance between the VOX GAIN and ANTI-VOX is easily obtained when the microphone is at least a foot from the speaker.

8. Adjust the DELAY control to hold the transmitter keyed for the desired interval after you stop talking.

NOTE: A little experimenting on the air will reveal that only a small portion of the first spoken syllable is lost when the VX-2 is actuated. Short DELAY settings will result in most efficient operation. See page 12 (CW OPERATION), for Semi-Break-In instructions.

MARK II LINEAR AMPLIFIER

SPECIFICATIONS

Power Rating:

2000 Watts PEP Input in Single Sideband Mode.
1000 Watts DC input on CW AM or RTTY.

5 Frequency Ranges:

1. 3,400- 4,500 kc
2. 6,000- 9,000 kc
3. 11,000-16,000 kc
4. 16,000-22,000 kc
5. 22,000-32,000 kc

Uses two Eimac 3-500Z Grounded Grid Triodes.

Drive Requirement:

100 Watts for maximum legal input.

Meter Selector:

Reads Plate Voltage, Plate Current, Grid Current, and Relative Output.

Includes Transmit-Receive Relay Control for simple operation with a Transceiver.

Wide range Pi Output Circuit matches 52 or 75 ohm coax cable or variety of other load impedances.

Dimensions:

13" wide × 7" high × 12" deep.

Weight: 20 lbs.

Power Supply:

Matching unit may be operated next to Amplifier, or with its 4½ foot connecting cable, may be placed on the floor.

Computer grade electrolytic capacitors, 40 mfd. filtering at 2500 VDC.

Silicon Rectifiers.

AC input: 117 or 230 volts, 50-60 cycles.

Includes quiet running fan for cool operation of all components.

Dimensions: 9" wide × 8" high × 14" deep.

Weight: 35 lbs.

CW FILTER, MODEL AF-800:

The Model AF-800 CW Filter is available for your 500-CX. It is a double toroid, high Q filter tuned to 800 cycles, and installs inside the 117-XC matching power supply-speaker. A control knob replaces the indicator light on the 117-XC, and switches the CW filter in and

out. Receiver bandwidth with the AF-800 is 400 cycles at the 6 db points, and provides very effective CW selectivity. The filter is operable with either speaker or headphones.

Note: Headphones should be high impedance type.

MOBILE ANTENNAS:

MODEL 35:

For maximum radiation efficiency, our single band design is the best. If you're a one band operator, or don't change bands very often, this is the model for you. Heavy duty construction is of the highest possible quality. Stainless steel whip has Kwik-on connector for easy removal. Each coil has a similar Kwik-on connector, also for easy removal and stowage. Power rating is 2000 watts P.E.P.! Heavy duty base sections of various lengths permit choice of deck or bumper mounting.

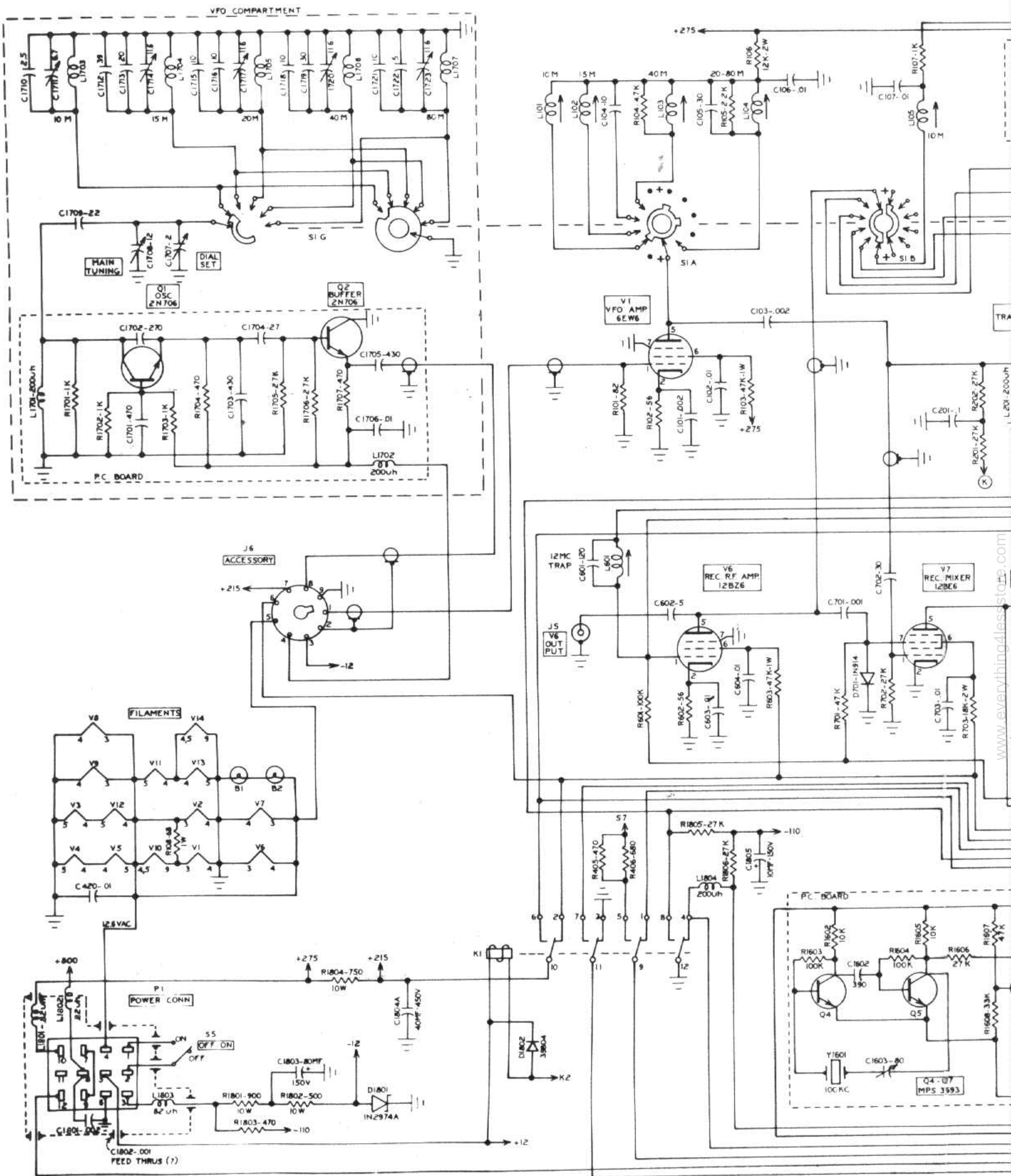
MODEL 45:

The Model 45 Swantenna is a manual band-switching mobile antenna for use on the 75, 40, 20, 15 and 10 meter amateur radio bands. The antenna assembly is a center loaded vertical radiator with nine preselected coil taps. The 75 meter phone band, 3.8 to 4.0 megacycles, is covered in five sections equally spaced across the 200 KC range. One tap on each of the other four bands provides coverage of the phone portions. Bandswitching is accomplished by progressively shorting out sections of the loading coil with a patented linear type switch.

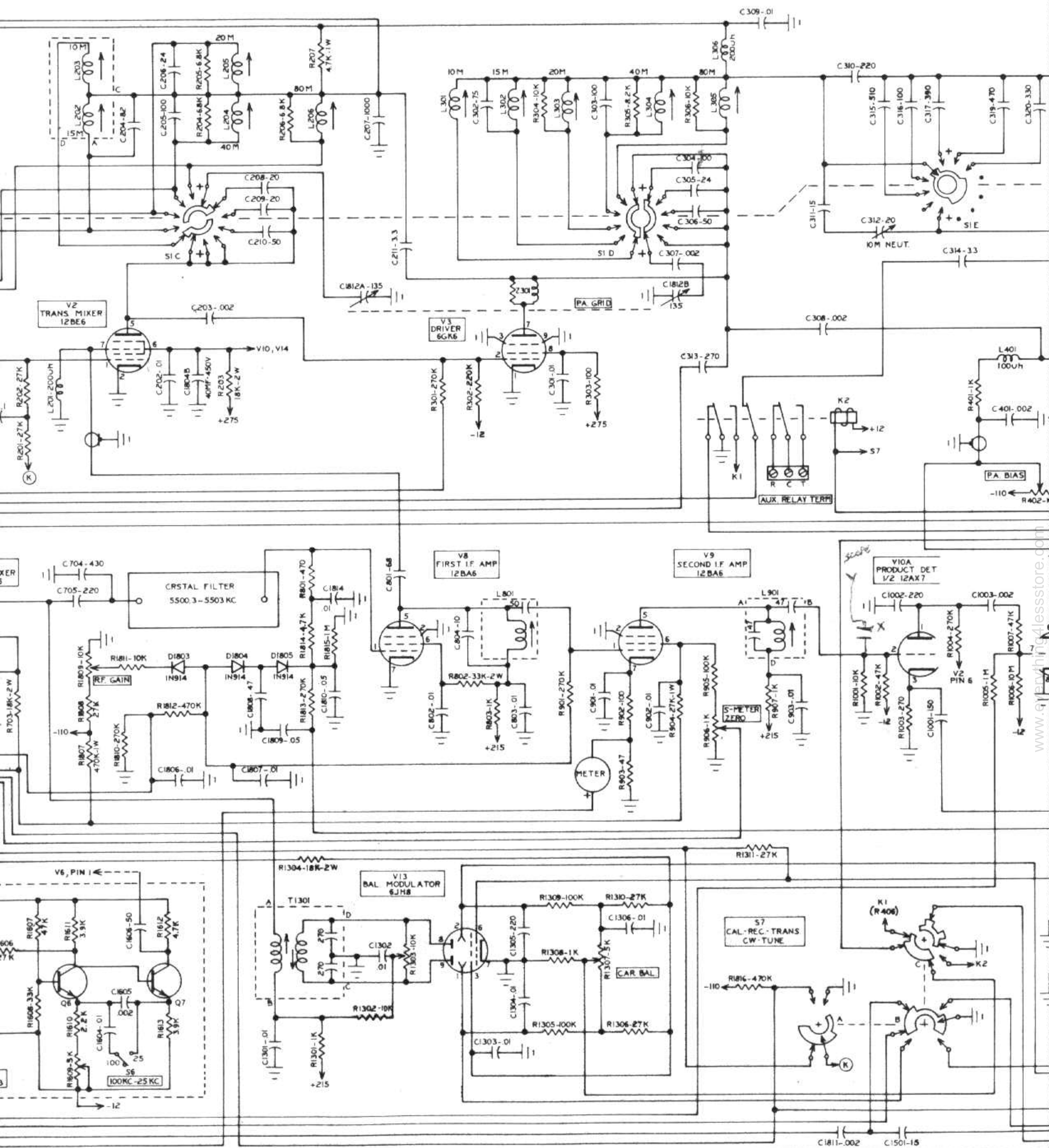
MODEL 55:

The Model 55 Swantenna is a remotely operated band-switching mobile antenna for use on the 75, 40, 20, 15 and 10 meter amateur radio bands. The band changing mechanism is in the base section of the antenna, and is controlled through a remote control unit which may be mounted within the vehicle near the operators position. The antenna assembly is a center loaded vertical radiator with nine preselected coil taps. The 75 meter phone band, 3.8 to 4.0 megacycles, is covered in five sections approximately equally spaced across the 200 KC range. One tap on each of the other four bands provides full coverage of the phone portions. Bandswitching is accomplished by progressively shorting turns in the loading coil with a patented linear switch which is actuated by a 12 volt motor driven cable assembly. The control unit provides up and down control of the switch by means of a spring loaded lever switch on the control unit. A two-position slide switch on the right side of the control unit selects the function which the meter is to perform. When the function switch is on BAND, a resistor network in the antenna base controls current through the indicator meter. Readout of the meter is in a discrete point indicating the band in use. When the function switch is on OUTPUT, the indicator meter functions as a capacity coupled untuned output meter to indicate relative output of the transmitter.





SCHEMATIC DIAGRAM - SWAN MODEL 500CX SINGLE SIDEBAND TRANSCEIVER



CEIVER

